On some Neogene to Recent species related to *Galeodina* Monterosato, 1884, *Galeodinopsis* Sacco, 1895, and *Massotia* Bucquoy, Dautzenberg, and Dollfus, 1884 (Caenogastropoda: Rissoidae) with the description of two new *Alvania* species from the Mediterranean Pleistocene

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ABSTRACT

Six species, related to the subgenera *Galeodina*, *Galeodinopsis*, and *Massotia*, are re-analyzed. *Alvania francescoi* new species (SE Sicily) and *A. rosariae* new species (SE Sicily and NW Peloponnesus) are described from Mediterranean Pleistocene. *Galeodinopsis* is regarded as the appropriate genus for Oligocene-Recent taxa having a quite conical shell close to that of some *Alvania* species and showing *Manzonia*-like combination of two microsculptural characters: the pitted surface on the spiral cords and the arrangement of the roughly prismatic elements forming numerous and very fine spiral threads. Its type species, *Rissoa tiberiana* (previously known from Mediterranean Mio-Pliocene), lives along the tropical W African coasts, where it is known under the name *A. fariai*. As suggested by the oldest record of *Galeodinopsis*, the European Oligocene *Rissoa duboisi*, this genus very likely originated from a pre-Neogene *Alvania* group. The syntype of *Rissoa prusi*, a scarcely known species (Pleistocene of Rhodes), and material (also from type locality) of the almost unknown *R. cingulata* (from Sicily) and of its close relative, *R. tenera* (Mediterranean, Atlantic Morocco and Canary Islands), is shown. These three taxa and the type species of *Galeodina* and *Massotia*, are here tentatively considered as belonging to *Alvania* sensu lato. With the exception of *A. cingulata*, all the discussed species have a multispiral protoconch. Generally, the protoconchs studied exhibit a sculptural pattern known in other rissoid taxa. Protoconch I of the type species of *Massotia*, *A. lactea*, is characterized by a coarser sculpture.

Additional Keywords: Rissoidae, taxonomy, Mediterranean-W Atlantic, Neogene-Recent, new species

INTRODUCTION

The genus *Alvania* Risso, 1826, comprises one of the most diversified groups in the caenogastropod family Rissoidae, especially when considering the tropical eastern Atlantic and the Mediterranean provinces. They inhabit a large variety of environments, from littoral to bathyal, and their geographical distribution is extensive, including the Mediterranean, Atlantic, Indo-Pacific, and the temperate Australian coasts (Ponder, 1985). Their stratigraphical distribution might extend back to the Late Cretaceous, but the first well-established records date to the early Tertiary (Ponder, 1985). With regard to the rich Mediterranean and European Tertiary *Alvania* assemblages, some of the most informative analyses are those of Sacco (1895), Seguenza (1903), Cossmann (1921), Lozonet (1998), Kowalke and Harzhauser (2004), and Chirli (2006).

Many authorities, e.g. Monterosato (1884), Bucquoy et al. (1884), Weinkauff (1885), Kobelt (1888), Locard (1886), Nordsieck (1968, 1972), Jeffreys (1867, 1869), Pallary (1920), Wenz (1938), Warén (1973, 1974), Gofas and Warén (1982), Van Aartsen (1982a, 1982b), Moolenbeek and Hoenselaar (1989, 1998), Van der Linden and Wagner (1989), Moolenbeek et al. (1991), Van der Linden (1993), Bonchet and Warén (1993), Giannuzzi-Savelli et al. (1996), Palazzi (1997), Gofas (1999), Ávila (2000), and Arduino and Arduino (2001), have contributed to the knowledge of the rich Recent Eastern Atlantic (especially the W Africa and the Macaronesian Province) and Mediterranean fauna. Ponder's rissoid revision (1985), listing five *Alvania* subgenera, provided additional perspective to the taxonomy.

My attention is focused here on a relatively large, informal group of species of *Alvania* sensu lato characterized by shells with wide and ovate aperture, lacking an internal denticulation of the outer lip, and often bearing varices on a well-developed, inflated body whorl. These species have been historically assigned to the subgenera *Galeodina* Monterosato, 1884, *Galeodinopsis* Sacco, 1895, and *Massotia* Bucquoy et al., 1884. This subgeneric settlement was partially rejected by Ponder (1985), who,

modifying the systematic arrangement of Monterosato (1884) and Bucquoy et al. (1884), stated that grouping of the numerous species of *Alvania* was very difficult at the subgenus level. The same author included *Massotia* (type species: *Rissoa lactea* Michaud, 1830) and *Galcodinopsis* (type species: *R. tiberiana* Coppi, 1876) in the *Alvania* sensu stricto group and doubtfully considered *Galcodina* (type species *Turbo carinatus* Da Costa, 1778) as a valid subgenus on the basis of shell characters. Piani (1979) raised *Galcodina* to generic level and placed *Rissoa cingulata* Philippi, 1836, and *R. tenera* Philippi, 1844, therein.

The principal aim of this work is to provide, for the first time, as complete as possible a taxonomic dataset based on shell features. Species such as *Rissoa cingulata*, [often misidentified as *Alvania carinata* (Da Costa, 1778)], *R. prusi* Fischer, 1877, and *R. tiberiana* Coppi, 1876, are very poorly known or, in the case of the last taxon, the generic attribution to *Alvania* appears incorrect. I also describe two new species from the Pleistocene of the central Mediterranean area.

MATERIALS AND METHODS

Most of the examined material, all consisting of shells, is housed in the Muséum National d'Histoire Naturelle, Paris (Département Systématique et Evolution), in the private collections of Maurizio Forli (Prato, Italy) and of Stefano Palazzi (Modena, Italy). Remaining material is housed in the private collections of medshells.com (made available by Nino Adorni Sbrana, Grosseto, Italy), Stefano Rufini (Anguillara), in the Museum für Naturkunde (Humboldt University, Berlin), the Museo Geologico G.G. Gemmellaro and the Dipartimento di Geologia e Geodesia (both University of Palermo, Italy), in the Goulandris Natural History Museum (Kifissia, Athens), the Dipartimento di Scienze della Terra of the University of Catania, Italy, the Zoologisch Museum of Amsterdam, the Muséum National d'Histoire Naturelle of Paris (Département Histoire de la Terre), and in my personal collection. Many other private collections were visited.

In the parts dedicated to each species, a list of the material is provided with all information given in the original labels. An abbreviated list of essential synonymy and/or citations is provided.

The fossil material (all from the Mediterranean area), from the deposits of Dattilo (NW Sicily), Cartiera Mulino (Vittoria, SE Sicily, type locality of *Alvania francescoi* new species and *Alvania rosariae* new species), and Kyllini (Elea, NW Peloponnesus, Greece), was obtained by washing bulk samples on a serial sieves (0.5, 1, and 2 mm square meshes) and sorted using a stereomicroscope. The same procedure was followed for the Recent bulk samples collected from Magnisi (Siracusa, SE Sicily, the type locality of *Rissoa cingulata* Philippi, 1836) and Mondello (Palermo, NW Sicily) specifically to recover that species. Geological, stratigraphic and paleoecological information on the deposits of Cartiera Mulino, Dattilo and Kyllini are taken from Costa (1989), Garilli (1998; 2004), Garilli et al. (2005a; 2005b) and Garilli and Galletti (2007). The stratigraphic information on the Sicilian deposits of Birgi (Trapani) and Tommaso Natale (Palermo, originally attributed to the upper Pleistocene Thyrrenian by Ruggieri and Milone, 1973) are from Ruggieri and Unti (1988) and Hearty et al. (1986), respectively. For the remaining fossil material (mainly from Coll. Forli *ex*-coll. Palazzi), I followed the stratigraphic attributions reported by the collectors.

For all the discussed species, at least five shells were studied by the scanning electron microscope (SEM) using a Philips XL30 ESEM, except for the (sole) syntype of *Rissoa prusi* and *R. cingulata*, of which there were only three shells available. Specimens examined by SEM were cleaned in a Bransonic 5 ultrasonic machine using distilled water. Particular attention was given to protoconchs and teleoconch microsculptures as potential sources of taxonomic characters at species level. The number of protoconch whorls were counted according to Verduin's method (1977).

Shells were measured using a stereo microscope provided with a cross-line micrometer eyepiece. The position of any varix on the body whorl is indicated in degrees of the angles formed by the plane of the varix and of the outer lip.

Geographic, bathymetric, and stratigraphic distribution of each discussed species is based on the examined material and the literature. Published records were critically evaluated on the basis of good illustrations or satisfactory descriptions. This type of dataset allows for just a rough representation of the geographical distribution, especially for the Adriatic Sea and the easternmost Mediterranean basin, of which I found very little material from the collections studied.

Abbreviations are used as following: DGUP: Dipartimento di Geologia e Geodesia, Università di Palermo, Italy; DSTC: Dipartimento di Scienze della Terra, Università di Catania, Italy; GNHM: Goulandris Natural History Museum, Kifissia, Athens, Greece; MGUP: Museo Geologico G.G. Gemmellaro, Università di Palermo, Italy; MNHN-DHT: Muséum National d'Histoire Naturelle, Département Histoire de la Terre, Paris, France; MNHN-DSE: Muséum National d'Histoire Naturelle, Département Systématique et Evolution, Paris, France; MPOB: Dipartimento del Museo di Paleobiologia e dell'Orto Botanico, Università di Modena e Reggio Emilia, Modena, Italy; MSNCS: Museo Regionale di Storia Naturale e Mostra Permanente del Carretto Siciliano, Terrasini, Italy; ZMA: Zoologisch Museum Amsterdam, Holland; ZMB: Museum für Naturkunde, Humboldt Universität, Berlin, Germany; Coll.: collection; Coll. MF: Maurizio Forli collection, Prato, Italy; Coll. PAL: Stefano Palazzi collection, Modena, Italy; Sh(s): shell(s), used in the Material Examined sections only.

SYSTEMATICS

Family Rissoidae Gray, 1847
Subfamily Rissoinae Gray, 1847
Genus *Alvania* Risso, 1826

Type Species: *Alvania europea* Risso, 1826 [synonym of *A. cimex* (Linnaeus, 1758)], subsequent designation by Nevill, 1885

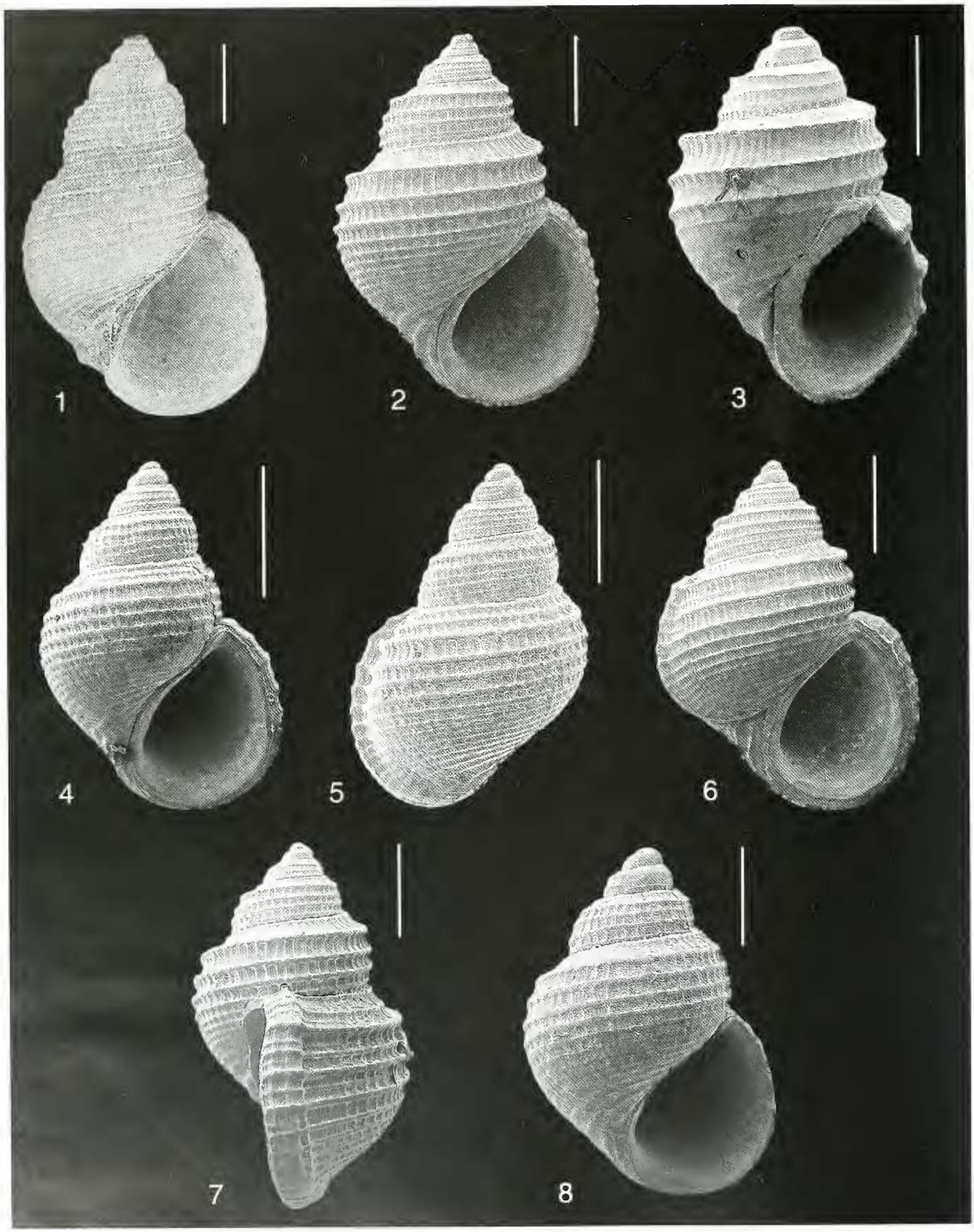
Alvania carinata (Da Costa, 1778)
(Figures 1–14)

Turbo carinatus Da Costa, 1778: 102–103, pl. 8, fig. 10
Rissoa trochlea Michaud, 1830: 16, fig. 4
Galeodina cingulata (Philippi, 1836).—Piani, 1979: 70–71, figs. 2–3

Description: Shell small, sturdy, conical and keeled to slender and turrited, reaching about 5 mm (rarely 6 mm) in height; 3.9–4.1 mm in width. Protoconch multispiral, conical, consisting of about 2.2 convex whorls. Protoconch I with 0.8 whorls, sculptured with six very fine spiral lirae and microscopic granules between them. Protoconch/teleoconch transition well-marked and sinuous. Protoconch II sculptured with sparse, spirally arranged microscopic pimples, stronger in adapical direction, and one to two spiral ridges, one of them always very close to lower suture. In the largest shells, teleoconch formed by 4–4.5 moderately convex whorls. Common morph (Figures 2, 6–7) with teleoconch whorls markedly dominated by spiral sculpture, which consists of very strong cords (numbering 2–3, 3–6, 6–12, and 12–17 on first, second, third, and last teleoconch whorl, respectively). Secondary, less conspicuous cords may occurr on last whorl. More marked spiral cords on adapical portion of whorls, at a certain distance from suture, give a characteristic keeled shape. Cords progressively less strong on basal area. Unkeeled morph (Figures 1, 4–5) characterized by a slender shell shape, usually bears more spiral cords (18–20) on last whorl. Axial sculpture always formed by numerous (32–50 on penultimate whorl), occasionally very narrow and lamella-like ribs, becoming obsolete toward base. Intersection of ribs with spiral cords gives an almost general clathrate pattern in unkeeled morph. Intersection of spiral and axial sculptures nodular, usually forming squares (Figure 14), with exception of last whorl where a rectangular pattern occurs (Figure 13). Microsculpture consists of very fine spiral threads (Figures 13–14), covering all teleoconch surface, with exception of main spiral pattern. On early teleoconch whorls, spiral lirae often alternate with spiral alignments of microscopic pimples. Sutures slightly inclined. Last whorl well expanded, comprising 3/5 to 3/4 (rarely more than 3/4, Figure 3) of shell height, often bearing one or two varices (mainly in keeled morph) with angles of 10°–340°. Aperture wide, ovate, slightly rounded to angled in the posterior part, comprising 3/5 to 3/4 of last whorl height. Outer lip slightly prosocline, internally smooth, externally markedly thickened by a strong rim very close to lip edge, and covered by spiral cords. Inner lip moderately arcuate and rather thickened, with a very narrow to discretely expanded (Figure 3) callus delimiting a very small umbilical chink.

Type Locality: Cornwall, southwestern England.

Material Examined: Great Britain: Cornwall, Falmouth, 1 sh., coll. MF, 1974, E55A; Channel Islands, Herm, 11 shs, coll. MF, 09.1974, E54A. Atlantic France: Normandy, Carteret, 3 shs, coll. MF, Jul. 1973, E28A; lower Normandy, St. Pair, 7 shs, MNHN coll. Denis, 1945; Brittany, Finistère Anse de Bertheaume, 20–30 m, industrial dredging, 4 shs, MNHN coll. S. Gofas, 1978; Brittany, Cote-du-Nord Plomanac'h, fissures of infralittoral rocks, 1 sh., MNHN coll. S. Gofas, 1973–78; Brittany, Finistère Roscoff, "les Cochons Noirs", sand and conchiferons gravel, 20 m, 27 shs, MNHN coll. Gofas, Jul. 1994; Brittany, St. Lunaire, 20 shs, MNHN Coll. Fischer, 1898; Brittany, St. Servan, 10 shs, MNHN coll. Staadt, 1969; Brittany, St. Lunaire, 2 shs, MNHN coll. Ph. Dautzenberg (figured in Bucquoy et al., 1884, pl. 35, figs. 1, 2); St. Lunaire, 5 shs, MSNCS, 7173 and 7174, 20 Jun. 1970, on the beach at low tide; Brittany, Morlaix, Saint Michel en Grève, 2 shs, coll. MF, 1976, E25A; Brittany, Saint Jacut, 3 shs, coll. MF, 06.1975, E12A; Brittany, Saint Jacut, 14 m, 6 shs, coll. MF, 04.1974, E12B; Brittany, Carnac, Quiberon, 4 shs, coll. MF, 1970, E16B; Brittany, Carnac, Quiberon, Pointe de Couquel, 2 shs, coll. MF, 1970, E11A; Brittany, Saint Malo, 7 shs, coll. MF, 07.1973, E13A; Brittany, St. Malo, Lizardrieux, 1 sh., coll. MF, Aug. 1982, E69A. Atlantic Pyrenees, Aquitaine, St. Jean de Luz, Cote Basque, infralittoral rocks, 1 sh., MNHN coll. S. Gofas, 1980–81; Atlantic Pyrenees, Aquitaine, St. Jean de Luz, 73 shs, MNHN coll. H. Fischer, 1898; Aquitaine, Soulac, 1 sh., MNHN coll. A. Dolfus; Aquitaine, Hendaye, 2 shs, coll. MF, Jul. 1976, E57A. Portugal: Algarve Sagres, Baie de Baleeira, (37°00.7′ N, 08°55.0′ W), tide zone, 1 sh., MNHN, Mission Algarve, May 1988; Algarve Sagres, Ponta da Baleeira, (37°00.3′ N, 08°55.5′ W), 17–23 m, 5 shs, MNHN, Mission Algarve, May 1988; Algarve Sagres, Pontal dos Corvos, (37°01.3′ N, 08°58.3′ W), at the foot of falaise, 17–22 m, 5 shs, MNHN Mission Algarve, May 1988; Albufeira (southern coast), Ponta de Castelo, 3–6 m, 2 shs, coll. MF, 08 Aug. 1985, E50B. Atlantic Morocco: Asilah, mouth of Oued el Helou, conchiferous deposits, beach, 6 shs, MNHN coll. S. Gofas, 1971–72. Strait of Gibraltar: Tanger, Grande Plage, conchiferous deposits, beach, 3 shs, MNHN coll. S. Gofas, 1970–81; Cadiz, Getares, beach, 3 shs, coll. MF, *ex* coll. C. Bogi, legit Hanselaar, 2230 GET; Cadiz, Barbate, conchiferous deposits, beach, 6 shs, MNHN coll. S. Gofas, 1976–81; south Ceuta, Punta del Desnarigado, (35°53.6′ N, 05°16.8′ W), 16–20 m, 1 sh., MNHN coll. Bouchet, Gofas and Lozouet, May 1996. Mediterranean Spain: Castellon, Columbretes Islands, Espinosa Island, 5 m, 1 sh., coll. MF, 26 Jul. 1974, M273A; Malaga, 15 m, 7 shs, coll. MF, *ex* coll. Cesare Bogi, 21271MA(V002G); Malaga, Algeciras, Torre del Almirante, 3–5 m, 1 sh., coll. MF, 28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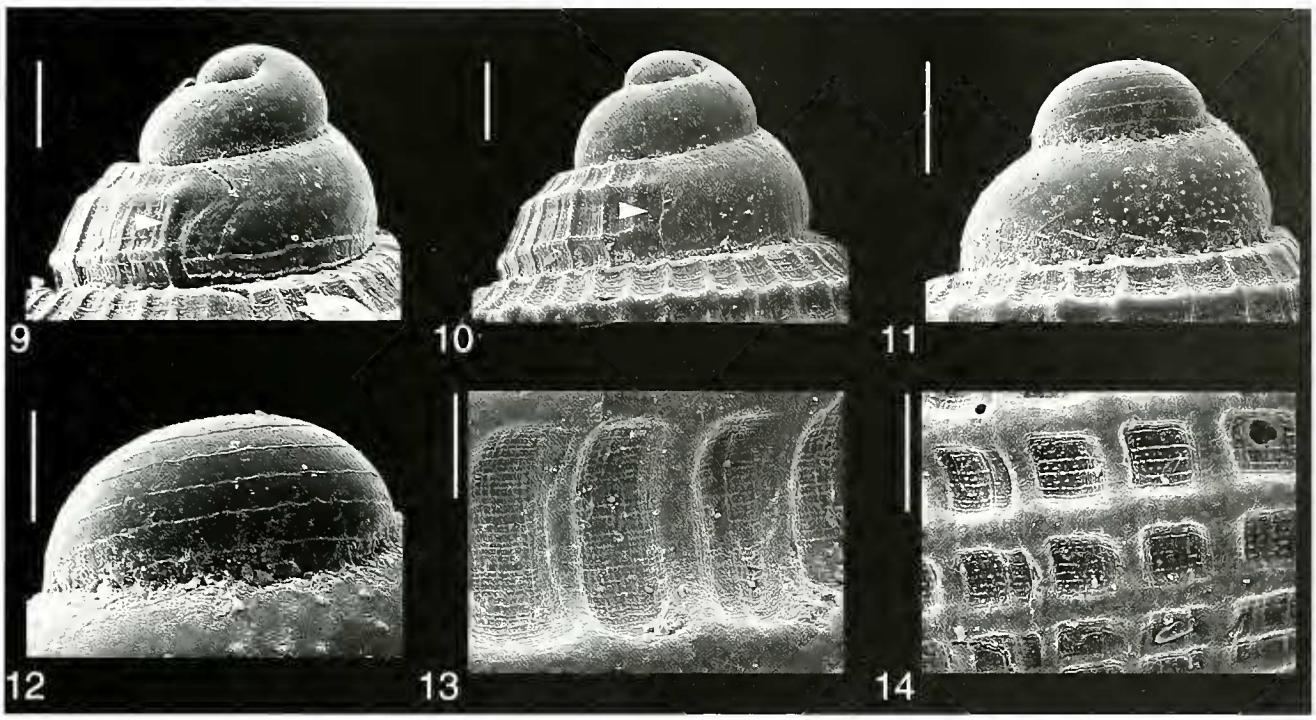


Figures 9–14. *Alvania carinata* (Da Costa, 1778), protoconch and details of sculpture. **9.** Sicily, Palermo, Terrasini, "Magaggiare-Cincca di Cinisi" beach, coll. PAL, (146E), protoconch. **10.** Provence, Marseille, La Baule, small beach at 25 km west from Marseille, coll. PAL (212SBAU-V00SC), protoconch. **11–12.** Shell from the same locality and collection, sculpture of protoconch I and II (11) and a detail of protoconch I (12). **13.** Same shell as Figure 2, detail of teleoconch sculpture on the penultimate whorl, coll. PAL (307B). **14.** Detail of teleoconch sculpture on the last whorl, NW Sicily, Palermo, Terrasini, "Magaggiare-Cincca di Cinisi" beach, detritus of *Miniacina*, coll. PAL (146E). Scale bars: 100 μm in Figures 9–11 and 13–14; 50 μm in Figure 12. White arrows indicate the protoconch/teleoconch boundary, respectively.

Sep. 1976, M207B; Malaga, Algeciras, 3 shs, coll. MF, 23 Sep. 1976, M207A; Malaga, Fuengirola, 0.5–1 m, 1 sh., coll. MF, 20 Aug. 1973, M68B; Malaga, Algeciras, Playa Getares, 6 m, 1 sh., coll. MF, Aug. 1983, M207E; Malaga, Cabo Pino, detritus, 10 m, 2 shs, coll. S. Rufini, (41.80g). Mediterranean Morocco: M'diq "(anc. Rincón)" conchiferous deposits, beach, 1 sh., MNHN coll. S. Gofas, 1971. Algeria: Alger, 1 sh., MNHN coll. Locard. Mediterranean France: Languedoc, Carnon, conchiferous deposits, beach, 1 sh., MNHN coll. S. Gofas, Aug. 1976; Languedoc, Roussilion, 3 shs, MNHN Coll. Dolfus, 1903; Languedoc, Roussilion, 1 sh., MNHN coll. Ph. Dautzenberg (Moll. du Roussillon); Provence, Marseille, La Baule, small beach at 25 km west from Marseille, 3 shs, coll. MF, *ex* coll. C. Bogi, Oct. 1986, 212SBAU (V00SC); Provence, Marseille, Cape Couronne, 4 shs, coll. MF, *ex* coll. C. Bogi, Oct. 1987, 2129COU (V00SE); Provence, Marseille, Grand Congloue, (43°10.6′ N, 05°24.2′ E), 33 m, 31 shs, MNHN rec. 11. Zibrowius Jun. 1996; Provence, Iles Embiez, conchiferous deposits, beach, 10 shs, MNHN coll. S. Gofas, 1968–70; Provence, Iles Embiez, Petit Rouveau, dredging of sandy conchiferous bottom, 3–5 m, 5 shs, MNHN coll. S. Gofas, 1968–70; Provence, St. Clair, infralittoral rocks, (43°08.2′ N, 6°23.2′ E), 0–1 m, 1 sh., MNHN rec. S. Gofas, Sep. 1992; Provence, St. Raphael, 2 shs, MNHN coll. Locard; Provence, 9 shs, MNHN coll. Petit, 1873; Provence, Sanary, 1 sh., MNHN coll. Locard; Corsica, Ajaccio, 3 shs, MNHN coll. Jousseaume, 1921; Corsica, Galeria, Punta Stollo, 6 m, 1 sh., coll. MF, 07 Aug. 1984, M52D; Corsica, Pianottoli, Anse de Chevanu, 2 shs, coll. MF, Jun. 1988, M77A. Tunisia: Djerba, Aghir, 5 m, *Posidonia* bed, 1 sh., coll. MF, S. Palazzi legit 06 Aug. 1993, M79A; Djerba, Al Jazirah, 1–2.5 m, 1 sh., coll. MF, Aug. 1974. M9B. Italy: Friuli Venizia Giulia, Trieste, beach, 7 shs, coll. MF, D. Di Massa legit 1976,

Figures 1–8. *Alvania carinata* (Da Costa, 1778), variation in shell shape and sculpture. **1.** "Form" *ecarinata* Bucquoy et al., 1884, shell from coll. Ph. Dautzenberg (Moll. du Roussillon), MNHN-DSE. **2.** Typical, keeled morph, Liguria, Genova, Camogli, 42 m, coll. PAL (307B). **3.** Markedly keeled morph, corresponding to *Rissoa trochlea* Michaud, 1830. Strait of Gibraltar, Cadiz, Getares, beach, coll. PAL (2230 GET). **4–5.** Small, unkeeled morph, La Spezia, Monterosso, 15–30 m, coll. PAL (70A). **6.** Typical morph with varice, Sardinia, Sassari, Capo Caccia, Cala della Calcina, 6 m, coll. PAL, (112A). **7.** Profile view of the same shell as Figure 2. **8.** Juvenile shell fitting well with the concept of *Alvania cingulata* (Philippi, 1836) *sensu* Piani (1979, figs. 2–3). Scale bars: 1 mm in Figures 1–7; 0.5 mm in Figure 8.

307B; Liguria, Genova, Camogli, 42 m, 1 sh., coll. MF, 06.1981, 271B; La Spezia, Monterosso, 15–30 m, detritus, 1 sh., coll. MF, A. Lugli legit Oct. 1978, 70A; La Spezia, Portovenere, 5–25 m, 3 shs, coll. MF, Oct. 1978, 329A; La Spezia, Riomaggiore, 30 m, 1 sh., coll. MF, Aug. 1978, 312A; Liguria, La Spezia, Punta Mesco, 35 m, 1 sh., coll. MF, Jul. 1987, 176C; Tuscany, Livorno, San Vincenzo, Borraccia, 12 m, 1 sh., coll. MF, 12 Jul. 1987, 190A; Tuscany, Livorno, Secche della Meloria, 6–17 m, 2 shs, coll. MF, 1974, 34E; Tuscany, Livorno, Castiglioncello, 4 shs, coll. MF, 1972, 21A; Tuscany, Livorno, Romito, off mouth of the torrent Chiona, 30–35 m, 2 shs, coll. MF, *ex* coll. C. Bogi, 36A; Tuscany, Livorno, Bagni Finme, 20 shs, coll. MF, 1977, 34B; Tuscan Archipelago, Island of Capraia, 100/400 m, 2 shs, coll. MF, *ex* coll. C. Bogi, 2126CAP(V005G); Island of Capraia, Punta della Fica, 29 m, 1 sh., coll. MF, 15 Sep. 1985, 28R; Island of Capraia, Punta Civitata, 40 m, 1 sh., coll. MF, 19 Sep. 1985, 28T; Tuscan Archipelago, Gorgona Island, 35–40 m, 11 shs, coll. MF, Aug. 1978, 69A; Gorgona Island, 40 m, 18 shs, coll. MF, legit C. Bogi, 194; Tuscany, Siena, 1 sh., yellow sands from unknown layer, lower Pliocene, coll. MF *ex* coll. PAL, F22A; Tuscany, Grosseto, Punta Ala, Baia Verde, 5 m, 1 sh., coll. MF, G. Terzer legit 08 Sep. 1974, 27A; Tuscany, Grosseto, Punta Ala, Punta Hidalgo, 2 shs, coll. MF, Jun. 1975, 27B; Tuscany, Grosseto, Follonica, Cala Felice, 7 m, 1 sh., coll. MF, 25 Aug. 1987, 55B; Tuscany, Grosseto, Island of Palmaiola, 28 m, 2 shs, coll. MF, 14 Sep. 1986, 172A; Grosseto, Island of Elba, Capo Calamita, Scogli Corbelli, 46 m, 1 sh., coll. MF, Sep. 1972, 5E; Island of Elba, Scoglio Remaiolo, 35 m, 1 sh., coll. MF, May 1980, 5K; Island of Elba, Formiche della Zanca, 20 m, 1 sh., coll. MF, Apr. 1984, 5P; Lazio, Rome, Civitavecchia, 2 shs, coll. MF, 1975, 137B; Sardinia, Sassari, Capo Caccia, Cala della Calcina, 6 m, conchiferous detritus at upper limit of *Posidonia* bed, 10 shs, coll. MF, S. Palazzi legit 19 Aug. 1983, 112A; Sardinia, Sassari, bay at E of Faro di Capo Testa, 7–19 m, 1 sh., coll. MF, 22 Aug. 1983, 125B; Nuoro, Capo Comino, Ruia Island, 0–2 m, 1 sh., coll. MF, 1974, 75A; Sardinia, Cagliari, Island of San Pietro, channel of San Pietro, 2–4 m, *Posidonia* bed, 2 shs, coll. MF, G. Liuzzi legit 10 Oct.1976, 264A; Sardinia, Cagliari, Island of Sant'Antioco, Cala de Saboni, 1 sh., coll. MF, 07 Aug. 1983, 115B; Sardinia, Cagliari, Island of Sant'Antioco, Cala de Saboni, 14 m, 1 sh., coll. MF, 10 Aug. 1983, 115E; Campania, Napoli, Island of Capri, Punta Vivara, 6 m, 1 sh., coll. MF, 08 Sep. 1978, 254B; Campania, Napoli, Island of Procida, Marina Grande, 2.5–9 m, 2 shs, coll. MF, 1974, 105A; Puglia, Bari, off Palese, 12–13 m, 1 sh., coll. MF, 11 Sep. 1979, 77A; Puglia, Taranto, 2 shs, coll. MF, 1973, 84B; Puglia: Taranto, Campomarino, 2 shs., coll. MF, 12 Feb. 1977, 309A; Puglia, Taranto, Maruggio, 1 sh., coll. MF, 1977, 280A; Puglia, Brindisi, "Batteria Brin" beach, 14 shs, coll. MF, G. Oriolo legit 08.1970, 193D; Puglia, Brindisi, Punta Croce, 15 m, 19 shs, coll. MF, G. Oriolo legit Aug. 1974, 262A; Puglia, Brindisi, Torre Guaceto, 5 m, 1 sh., coll. MF, 1976, 42A; Brindisi, Lendinoso, 10–20 m, 1 sh., coll. MF, 1977, 279A; Puglia, Lecce, Gallipoli, Costa Brada, 2 shs, coll. MF, Apr. 1978, 91B; Lecce, Porto Cesareo, 2 shs, coll. MF, Oct. 1977, 46B; Lecce, Porto Cesareo, Torre Lapillo, 1 sh., coll. MF, 06 Jun. 1978, 46C; Lecce, Marina di Ugento, 30 m, 1 sh., coll. MF, 1977, 68C; Lecce, Gallipoli, La Vecchia Torre, 2–6 m, 2 shs, coll. MF, 1976, 91D; Lecce, San Cataldo, 1 sh., coll. MF, Apr. 1973, 260C; Lecce, Specchiulla, 1 sh., coll. MF, Oct. 1974, 281A; Calabria, Reggio Calabria, Pentimele, from fisherman nets, 8 m, 1 sh., coll. MF *ex* coll. Sciano, V060A 194; Reggio Calabria, Laureana di Borrello, Pecoraio, 2 shs, (layer 2), lower Pleistocene, coll. MF *ex* coll. PAL, F24A; Sicily, Trapani, San Giuliano, 10 shs, coll. MF, 25 Jul. 1978, 297A; Trapani, Scopello, Tonnara, 12–20 m, 1 sh., coll. MF, 06 Apr. 1986, 333F; Sicily, Trapani, Egadi Islands, Favignana, Secca del Toro, 30 m, 20 shs, coll. MF, A. Lugli legit 02 Jun. 1983, 272H; Egadi Islands, Favignana, 4 m, 17 shs, coll. MF; Egadi Islands, Favignana, Cala Rotonda, 20–30 m, 3 shs, 04 Jun. 1983, coll. MF, 272G; Egadi Islands, Favignana, Scoglio Corrente, 30 m, 3 shs, coll. MF, 01 Jun. 1983, 272F; Egadi Islands, Favignana, Punta Sottile, 30–40 m, 4 shs, coll. MF, 30 May 1983, 272E; Egadi Islands, Marettimo, Punta Bassana, 41 m, 2 shs, coll. MF, 04 Jun. 1983, 140A; Egadi Islands, Levanzo, Faraglione, 7–12 m, 3 shs, coll. MF, 03 May 1979, 325B; Sicily, Pantelleria Island, Baia dei Fichi d'India, 22 m, 1 sh., coll. MF, Jul. 1983, 154M; Pantelleria Island, Punta Capace, 31 m, 1 sh., coll. MF, Jul. 1983, 154N; Sicily, Palermo, 1 sh., coll. MF *ex* coll. C. Bogi, (V056A) 194; Palermo, Bagheria, Aspra, 18.5 m, 2 shs, coll. MF, Apr. 1973, 124C; Palermo, Punta Raisi, Marina Longa, 1 sh., coll. MF, 28 Feb. 1979, 320A; Palermo, Terrasini, "Magaggiare-Ciucca di Cinisi" beach, detritus of *Miniacina*, 14 shs, coll. MF, S. Palazzi legit 23 Sep. 1977, 146E; Palermo, Island of Ustica, Scoglio del Medico, 25 m, 1 sh., coll. MF, Aug. 1980, 286K; Sicily, Messina, Milazzo, Capo Milazzo, Cala Sant'Antonio, 2 shs, upper yellow sands, upper Pleistocene, coll. MF *ex* coll. PAL, F5A; Messina, Eolie Islands, Lipari, Secca del Bagno, 38–40 m, 3 shs, coll. MF, 05 Sep. 1979, 338A; Sicily, Catania, Acitrezza, 3–25 m, 2 shs, coll. MF, Sep. 1975, 22A; Sicily, Siracusa, Vendicari, bay, 2 shs, coll. MF, 13 Sep. 1977, 20A; Siracusa, Portopalo di Capo Passero, 2–3 m, 1 sh., coll. MF, Jun. 1976, 63A; Siracusa, Peninsula of Magnisi, southern side, 1 sh., coll. V. Garilli, Jun. 2006; Sicily, Palermo, Tommaso Natale, 1 sh., late middle Pleistocene, MGUP 166/2/49; Sicily, Trapani, Birgi, 3 shs, upper Pleistocene, Tyrrhenian Stage, MGUP 1765/36/14; Sicily, Trapani, 12 shs, upper Pleistocene, Tyrrhenian Stage, MGUP 358/3/42. Isle of Malta: Malte, 8 shs, MNHN coll. Jousseaume, 1921. Croatia: Istria, Rovinij, between Rt. Muntrav, Hr. Muntrav and Hr. Azino, 8–15 m, detritus from bottom, 11 shs, coll. MF, S. Palazzi legit 19 Jun. 1978, M188B; Istria, Savudrija, beach, 8 shs, coll. MF, S. Palazzi legit Oct. 1975, M364A; Istria, Rovinij, 6–18 m, 19 shs, coll. MF, 20 Jun. 1978, M188A; Istria, Vrsar, 1 sh., coll. MF, 03

Apr. 1988, M76A; Istria, Umag, 1 sh., coll. MF, 1978, M109A; Istria, Umag, Taverna Lero, 0.3 m, 1 sh., 17 Jun. 1978, coll. MF, M109B; Kaciack, dam of Cigale, 4 m, 1 sh., 29 Jul. 1983, coll. MF, M14A. Greece (Aegean Sea): NW Aegean, Island of Limnos, near Moudros, 3–5 m, 48 shs, coll. MF, A. Lugli legit Aug. 1991, M80A; Sithonia, Ormos Panagias, 2–3 m, 1 sh., Aug. 1982, coll. MF, M31B; Sithonia, Nesis Dhiaporos, 33–34 m, 2 shs, coll. MF, 01 Aug. 1986, M31D. Unknown locality from Mediterranean Sea: 120 shs, MNHN coll. Vayssière.

Habitat: The species is usually found at depths compatible with the upper part of the shelf, the infralitoral stage of Pérès and Picard (1964). Rarely, I found material collected from the tidal zone. According to Gofas and Ponder (1991), *Alvania carinata* lives deeply buried under stones. It seems also to be linked (in the Mediterranean) to phanerogam beds. The finding of two shells from the Island of Capraia (Tuscan Archipelago), collected at a depth of 100–400 m, is much probably due to lower shelf-slope transport.

Distribution: Occurs probably throughout the Mediterranean, but its presence in the easternmost coasts, from which I did not see any material, needs to be confirmed. In the Atlantic it is recorded from the coasts of Great Britain south to Morocco. As fossil, it is rare in the Mediterranean Neogene where it is recorded from the lower Pliocene yellow sands near Siena. It becomes more frequent during the Mediterranean Quaternary, where I found it from the lower Pleistocene of Reggio Calabria, and the middle-upper Pleistocene of Sicily (Tommaso Natale, Capo Milazzo and Trapani).

Remarks: A complete synonymy list was provided by Piani (1979) and Van Aartsen (1982). In various collections, I found different lots of this species containing juvenile shells (not higher than 3 mm, see Figure 8) identified as *Alvania cingulata* (Philippi, 1836), species hereafter re-described and discussed. This wrong determination very likely follows the misidentification of Piani (1979, figs. 2–3) and Giannuzzi-Savelli et al. (1996, figure 499).

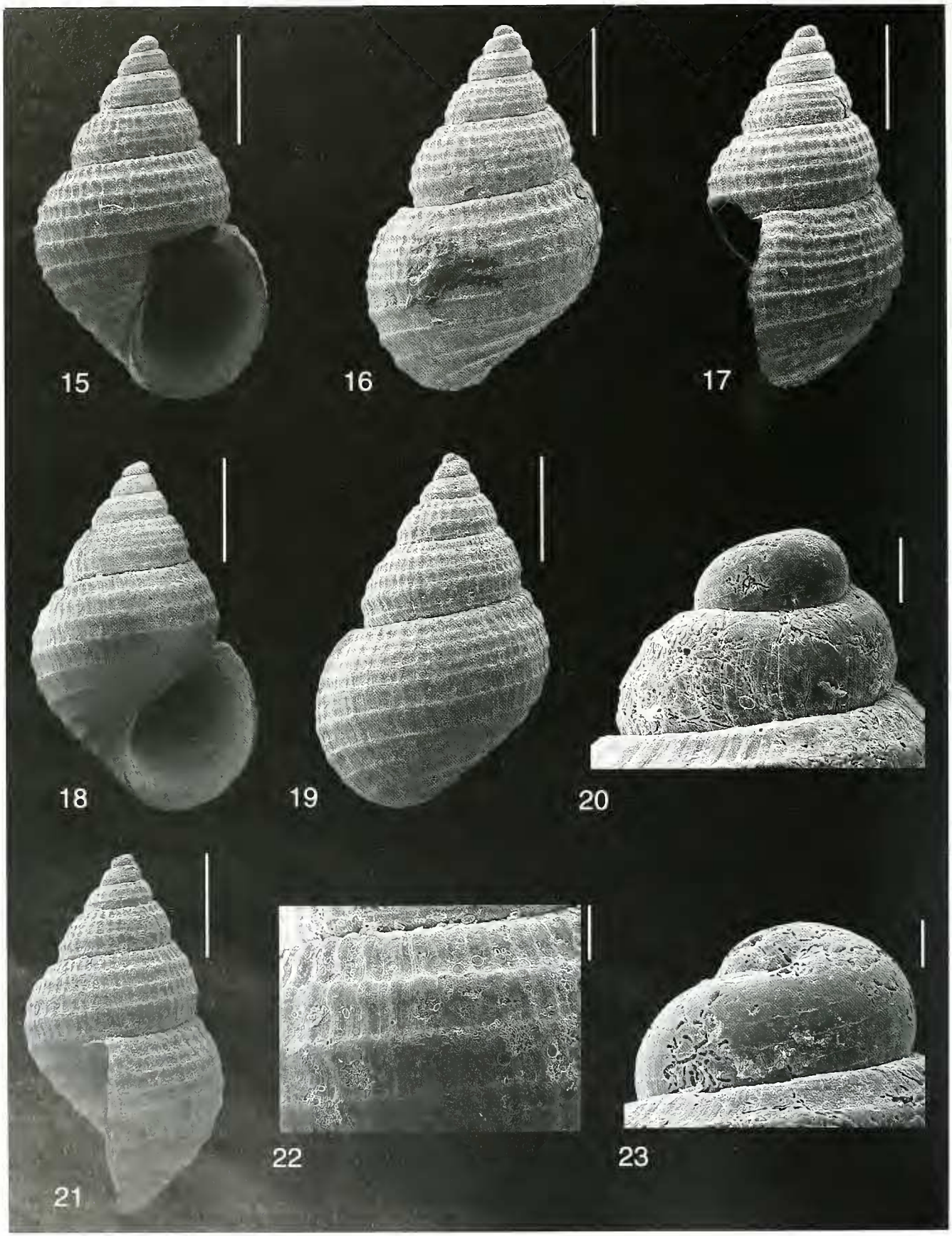
Typically, the shell of this species has a characteristic keeled shape due to the presence of well marked spiral cords that become very strong on the well-developed last whorl. The number of cords on adult whorls is slightly variable, 3–4 in the penultimate whorl. The not-keeled morph, characterized by having a slender and turrited shape and more numerous cords (5–6 in the penultimate whorl), is the "form" *ecarinata* Bucquoy et al., 1884 (Figures 1, 4–5), also known as *minor-ecarinata* Monterosato, 1884 (probably corresponding to *Rissoa lucullana* var. *cancellata* Scacchi, 1836, as indicated by Piani, 1979). It has been considered a Mediterranean subspecies of *A. carinata* by Van Aartsen (1982). I found no shells clearly belonging to this morph in the Atlantic material studied (mainly from the MNHN-DSE collections). However, in some Mediterranean areas (e.g. along the French coast in the MNHN-DSE collections), I found the typical morph together with unkeeled shells. Thus I am more inclined to consider it just a case of intraspecific variation, which appears well represented in Mediterranean populations. The keeled morph, characterized by having three spiral cords on subadult whorls and a very expanded body whorl (more than 3/4 of the shell height, see Figure 3) fits well within the concept of *Rissoa trochlea* Michaud, 1830, which is certainly a synonym of *A. carinata*.

Alvania carinata is the type species of *Galeodina* Monterosato, 1884, a genus created for cingulated, keeled, varicose rissoid shells with a wide aperture (Monterosato, 1884a, p. 163). This generic division can appear quite artificial, not being supported by appropriate and constant taxonomic features. Also, the consideration of *Galeodina* as a well-established subgenus of *Alvania*, as indicated by Wenz (1938) and Van Aartsen (1982), appears doubtful. Ponder (1985), who synonymized most of the available subgenera with *Alvania* sensu stricto, expressed some uncertainty when considering *Galeodina* as a valid taxon. He recognized the ignorance of anatomical features as the main gap in solving this systematic question. In any event, the shell characters alone do not provide enough support for *Galeodina* to stand as a subgenus. For example, the unkeeled morph, which usually lacks the main features of *Galeodina*, including the characteristic varices of the keeled morph, might be compared to the *Alvinia* Monterosato, 1884, species group, with which it shares a slender, turreted shell shape. It is noteworthy that Cossmann (1921) cited *Galeodina* as a synonym of *Alvinia*.

Alvania *cingulata* (Philippi, 1836)
(Figures 15–26)

Rissoa cingulata Philippi, 1836: 152–153.
Acinus cingulatus (Philippi).—Monterosato, 1884b: 62.
Cingula (*Onoba*) *cingulata* (Philippi, 1836).—Nordsieck, 1968: 46, pl. VII, fig. 26.35
Alvinia (*Galeodina*) *cingulata* (Philippi, 1836).—Nordsieck, 1972: 181, pl. RVI, fig. 20.

Description: Small, sturdy, conical-ovate shell reaching 3.5 mm in height, 2.2 mm in width. Protoconch paucispiral, consisting of little more than 1.5 convex and very rounded whorls, sculptured by 5–6 very fine spiral lirae. Several prosocirte growth scars precede protoconch/teleoconch transition (Figure 20). Teleoconch consists of about 4 cingulated convex whorls separated by slightly inclined sutures. Very early teleoconch whorls bear two main spiral cords crossed by numerous axial ridges. Sculpture of adult whorls consisting of spiral cords more conspicuous than axials, which are 5–6 and 10–11 on the penultimate and body whorls respectively. Axial sculpture formed by narrower (half the breadth of a spiral cord) ribs, numbering about 40 on penultimate whorl, and which become obsolete toward shell base. Microsculpture consists of spiral rows of small tubercles that do not seem to appear on main sculpture (Figure 26). A few irregular scars cross these spiral rows. Last whorl rather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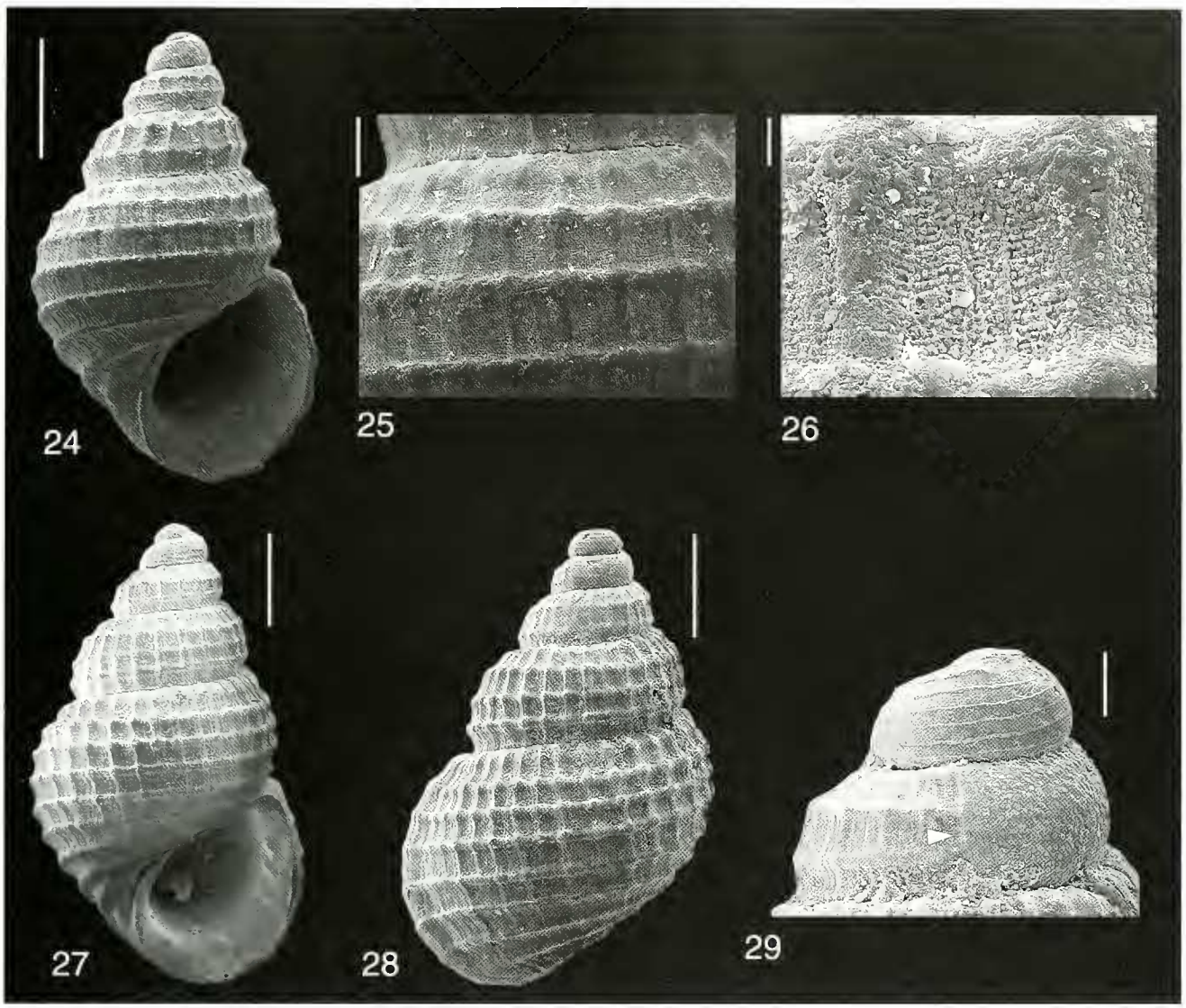


Figures 24–29. *Alvania cingulata* (Philippi, 1836) from type locality (Peninsula of Magnisi, Siracusa, SE Sicily, coll. Garilli), and a slightly resembling *Alvania* sp., from the lower Pleistocene of Musalà (Italy, Reggio Calabria, coll. MF *ex* coll. Pal, F95A), fitting well with the concept of *A. cingulata* stated by Monterosato (1884b). **24–26.** *Alvania cingulata*. Apertural view of a subadult shell (24), sculpture on last whorl (25) and microsculpture (26). **27–29.** *Alvania* sp. Apertural (27), dorsal (28) views and protoconch. Scale bars: 500 μm in figures 24, 27–28; 100 μm in figures 25, 29; 20 μm in Figure 26. The white arrow in Figure 29 indicates the protoconch/teleoconch boundary.

inflated and well-developed, comprising little less than 3/4 total height. Aperture wide and ovate, comprising about 4/9 and 2/3 of total height and last whorl respectively. Outer lip slightly prosocline, internally smooth, externally slightly thickened near edge. Columellar side arcuate, with a thin callus forming a very narrow umbilical chink. Coloration consisting of quite large, reddish-brown bands on a whitish-cream background.

Type Locality: Peninsula of Magnisi, Siracusa, southeastern Sicily.

Type Material: One possible syntype, ZMB (2326) *ex* coll. Philippi was destroyed by Byne's reaction (M. Glaubrecht, pers. comm., 2006)

Material Examined: Italy: NE Sicily, Messina, 2 shs. ZMB *ex* coll. Monterosato, 80914 (original label by

Figures 15–23. *Alvania cingulata* (Philippi, 1836). **15–17.** Apertural (15), dorsal (16), profile (17) view of one shell from ZMB *ex* coll. Monterosato (80914), Messina, NE Sicily. **20, 23.** Protoconch of the same shell. **18–19** and **21–22.** Another shell from the same lot, apertural (18), dorsal (19), profile (21) view, and a detail of sculpture on the last whorl (22). Scale bars: 1 mm in figures 15–19 and 21; 200 μm in Figure 22; 100 μm in Figure 20; 50 μm in Figure 23. The white arrows indicate the approximate protoconch/teleoconch boundary.

Monterosato: *Acinus cingulatus*, 2, Messina, 1014); SE Sicily, Siracusa, Peninsula of Magnisi, south side, detritus from the beach, 1 sh., coll Garilli, 6/2006

Habitat: Unknown. It is noteworthy that sandy and *Posidonia* bottoms prevail in the south side of the Magnisi Peninsula (from where I collected the beached shell in Figure 24), while an almost paralic (pre-lagoon) environment (with *Cerastoderma*, *Cerithium*, and *Gibbula* spp., on a finely sandy bottom) and a rocky bottom with algae characterize the north and east sides.

Distribution: Its distribution appears to be limited to Sicily, with particular regard to the eastern coast, from Messina to Magnisi. It was recorded from Palermo by Monterosato (1872; 1875; 1878; 1884a; 1884b), who very likely followed the citations of Philippi (1844) and Weinkauff (1885). The latter author, who indicated Mondello (the beach near Palermo), also cited Ognina (Catania) in eastern Sicily. To my knowledge, no fossil record of this species exists.

Remarks: This is a very rare, practically unknown species (see Van Aartsen, 1982a). Its identification has traditionally been quite problematic, above all after the misidentification by Piani (1979, figs.2–3), who illustrated a juvenile shell of *Alvania carinata* (Da Costa, 1778) under the name *Galeodina cingulata* (Philippi, 1836). The shell figured by Giannuzzi-Savelli et al. (1996, fig. 499), under the name *Alvania* (*Alvania*) *cingulata* (Philippi, 1836), is a subadult of *A. carinata*.

My identification is based on three shells (one from the type locality, two from ZMB *ex* Monterosato coll., labelled as *Acinus cingulatus*), which agree well with the original description by Philippi (1836; see also 1844: 128). A few diagnostic characters allow for its correct identification: the primary cingulated sculpture with raised cords, numbering 10–11 on the last whorl; the secondary axial pattern formed by very narrow ribs crossing the cords; the large ovate aperture; and the internally smooth outer lip, slightly thickened near its edge.

As Philippi (1844) noted, *Alvania cingulata* may be compared with *A. tenera*, especially with the slender morph of the latter species (see Figure 78). *Alvania tenera* has a smaller shell (usually not over 2.2 mm in height) with more raised cords (numbering 12–14 on the last whorl), and almost lamella-like ribs, which occur just on the interspaces between the cords (see discussion of *A. tenera*). Furthermore, *A. cingulata* has a paucispiral protoconch.

In addition, Nordsieck (1972) and Van Aartsen (1982) considered this species as belonging to *Galeodina*. However, the similarity between *Alvania cingulata* and *A. carinata* (type species of *Galeodina*) is superficial. Several differences separate the two: *A. cingulata* has a less inflated last whorl bearing less numerous cords and lacking varices, its outer lip lacks a varicose thickness, and its spiral sculpture does not markedly dominate over axial as in the typical *A. carinata*. The latter species also has a multispiral protoconch.

Monterosato (1884a and 1884b) included this species in his genus *Acinus* (synonym of *Alvania* according to Ponder, 1985), creating a link with the type species *Alvania cimex* (Linnaeus, 1758) (which is also the type species of *Alvania*, see Ponder, 1985: 36), mainly based on coloration. In reality, the similarity between the two species is limited to the color pattern of the shell and the nodular sculpture. Strong differences indicate that *A. cingulata* and *A. cimex* could be distant relatives, the latter having a more sturdy shell with a coarser sculpture (with subequal axial and spiral), and a proportionally smaller aperture provided with an internally denticulate outer lip. The concept of *A. cingulata* as expressed by Monterosato (1884b: p. 62) seems to be applicable to an interesting *Alvania* sp. (from the lower Pleistocene of southern Italy, Reggio Calabria, Musalà, 19 shs, F95A, coll., Figures 27–29) rather than to the original description by Philippi. The non-planktotrophic (see the paucispiral protoconch in Figure 29) *Alvania* sp., illustrated here, showing only a moderate similarity with the teleoconch sculpture of *A. cingulata*, has the characteristic general shape of *A. cimex*, with which it shares the apertural features, including the denticulations on the inner part of the outer lip. Furthermore Monterosato himself determined the shells I have illustrated in Figures 15–23 as *A. cingulata*.

In 1968, Nordsieck cited *A. cingulata* as *Cingula* (*Onoba*) *cingulata*. In reality, a vague similarity with some *Cingula* Fleming, 1828 or (more specifically) *Onoba* H. and A. Adams, 1852, species exists; e.g. *Onoba* (*O.*) *carpenteri* (Weinkauff) (see Ponder, 1985: fig. 114a), bears a similar spiral sculpture. Anyway, the genus *Onoba* is characterized by usually elongate shell with a proportionally smaller and more rounded aperture. Its included species, usually lacking the axial sculpture, may have a much weaker axial pattern or this may consist of delicate ribs, which become obsolete towards the sutures (see Bonchet and Warén, 1993: figs. 1508–1509, 1514–1515). In addition, the protoconch sculpture apparent on some non-planktotrophic *Onoba* species resembles that of *A. cingulata*, in having few, very fine spiral widely spaced threads. This kind of sculpture is also seen in *Alvania* (e.g. *A. subsoluta* (Aradas, 1847), see Bonchet and Warén, 1993, fig. 1458). *Cingula* species appear to be less similar to *A. cingulata* in having a thick outer lip and lacking any axial sculptural pattern.

A certain similarity exists with *Alvania watsoni* (Watson, 1873) from Madeira (see Ponder, 1985: fig. 102c–d), with which *A. cingulata* shares the general shell shape, characterized by an inflated last whorl provided with a large, ovate aperture.

Alvania francescoi new species
(Figures 30–43)

Description: Shell small, sturdy, conical-ovate, reaching 4.8 mm in height (4.3 mm in holotype) and 3.1 mm in width (2.8 mm in holotype). Protoconch conical, multispiral with partially immersed nucleus and convex

whorls. Protoconch I consisting of about 0.8 whorls sculptured by 5–6 fine spiral lirae interspersed spirally and irregularly with microscopic granules. Protoconch II consisting of about 1.2 whorls sculptured by pimples, which are irregular in size and arrangement. They are larger and less numerous in the adapical position; fused into very short prosocline tracts in central part. In the abapical part of late protoconch, groups of pimples are irregularly fused into fine, discontinuous spiral ridges. Protoconch/teleoconch transition well-marked and sinuous. Teleoconch consisting of 3.8–4.6 (4.2 in holotype) rather convex whorls, with strong cancellate sculpture formed by intersection of equally developed spiral cords and axial ribs. Cords are narrow and well raised, numbering 2, 6–7 (6 in holotype) and 13–15 (14 in holotype) in early, penultimate and body whorl, respectively. Two adapical cords are usually more pronounced in penultimate and last whorl. Cords are markedly stronger and more widely spaced on base. Secondary cords may commence on late body whorl, at a certain distance from outer lip. Axial sculpture consists of narrow raised ribs numbering 24–32 (26 in holotype) on the penultimate whorl. On base, ribs progressively become very narrow to obsolete toward columellar area. Intersection of spiral and axial sculpture, producing nodular small knobs, forms a rectangular pattern (with major side of rectangles perpendicular to shell axis) except on last whorl, where a quadrangular to rhomboidal pattern occurs (Figure 43). Microsculpture of very early teleoconch whorls consists of micropustules, sometimes fused, forming spirally, discontinuous and irregular rows, mainly occurring between spiral cords (Figure 42); weak growth lines are present. Fine sculpture of the rest of teleoconch limited to weak growth lines (Figure 43). Suture slightly inclined. Last whorl well-developed, comprising about three fourths of shell height. It may bear single (paratype 6) or double (paratype 4, Figure 37) varices, at angles of about 50° and 70° respectively. Aperture wide, ovate, and with a rounded profile in the posterior part, comprising about two thirds to three fourths of last whorl height. Outer lip orthocline, internally smooth, externally markedly thickened by a strong, sometimes doubled (Figure 31), rim, occurring very close to its edge and covered by spiral cords. Inner lip moderately arcuate and rather thickened, with thin callus delimitating very narrow umbilical chink.

Type Locality: Lower Pleistocene of Cartiera Mulino (36°36′57″ N, 14°34′03″ E), Vittoria, Ragusa, SE Sicily. The stratotype is the phanerogams-rich 3D1 layer of Costa (1989). This deposit crops out at about one hundred meters from the abandoned paper-mill known as Cartiera Mulino. Paleoenvironmental and stratigraphic information about this site are given by Costa (1989).

Type Material: Holotype (4.3 × 2.8 mm), DGUP CMRG 005/488, coll. V. Garilli. Paratype 1 (4.1 × 2.7 mm), DGUP CMRG 006/489, coll. V. Garilli; paratype 2 (4.8 × 3 mm), ZMA Moll. 4.07.007 (*ex* CM GR 007/490, coll. Garilli); paratype 3 (4 × 2.7 mm), ZMB MB.Ga.2479 (*ex* CMGR 008/49, coll. V. Garilli); paratype 4 (4.2 × 2.9 mm), MNHN A25950 (*ex* CMGR 009/492, coll. V. Garilli); paratype 5 (4.6 × 3.1 mm), DGUP CMGR 010/493, coll. V. Garilli; paratype 6 (4.5 × 3.1 mm), DGUP CM GR 011/494, coll. V. Garilli. All type material is from the type locality, 3D1 layer. DATE?

Etymology: The species honors the name of both Francesco Garilli senior, my father and first mentor in my life, and of Francesco Garilli junior, my son.

Habitat: All the shells came from the 3D1 layer of Costa (1989). The paleoenviromental reconstruction for this layer was characterized by Costa (1989) as comparable with the Mediterranean marine-marginal modern ecotone HP (*Posidonia* beds)-SVMC (*sensu* Pérès and Picard, 1964). It is interesting that the 3D1 layer is quite rich in *Posidonia* remains mainly consisting of leaves.

Distribution: This species is known from type locality only, lower Pleistocene of Cartiera Mulino, Vittoria, Ragusa, SE Sicily.

Remarks: This quite characteristic species shows a galeodiniform shape, having a quite inflated and well-developed (also with double varix) last whorl and a large aperture provided with an internally smooth outer lip. However, its spiral sculpture does not markedly prevail over the axial, as in the typical *Alvania carinata*. Its microsculpture, limited to the early teleoconch whorls, is similar to that observed in the analogous whorls of *A. carinata*, but in the latter this microsculpture is distributed over the entire teleoconch.

The strongly cancellated sculptural pattern of *A. francescoi* new species, consisting of well-raised, subequal spiral and axial elements forming marked nodular intersections, resembles that shown by *A. cimicoides* (Forbes, 1844). The latter species, showing a more typical *Alvania* shape, has a more slender shell, a less inflated and much less developed last whorl, and a proportionally smaller aperture with denticulations on the inner part of the outer lip.

Alvania francescoi new species can also be compared with *A. rosariae* new species described later in this report. Remarks on their similarities and differences will be dealt with in the section dedicated to the latter species.

Alvania lactea (Michaud, 1830)
(Figures 44–49 and 53–61)

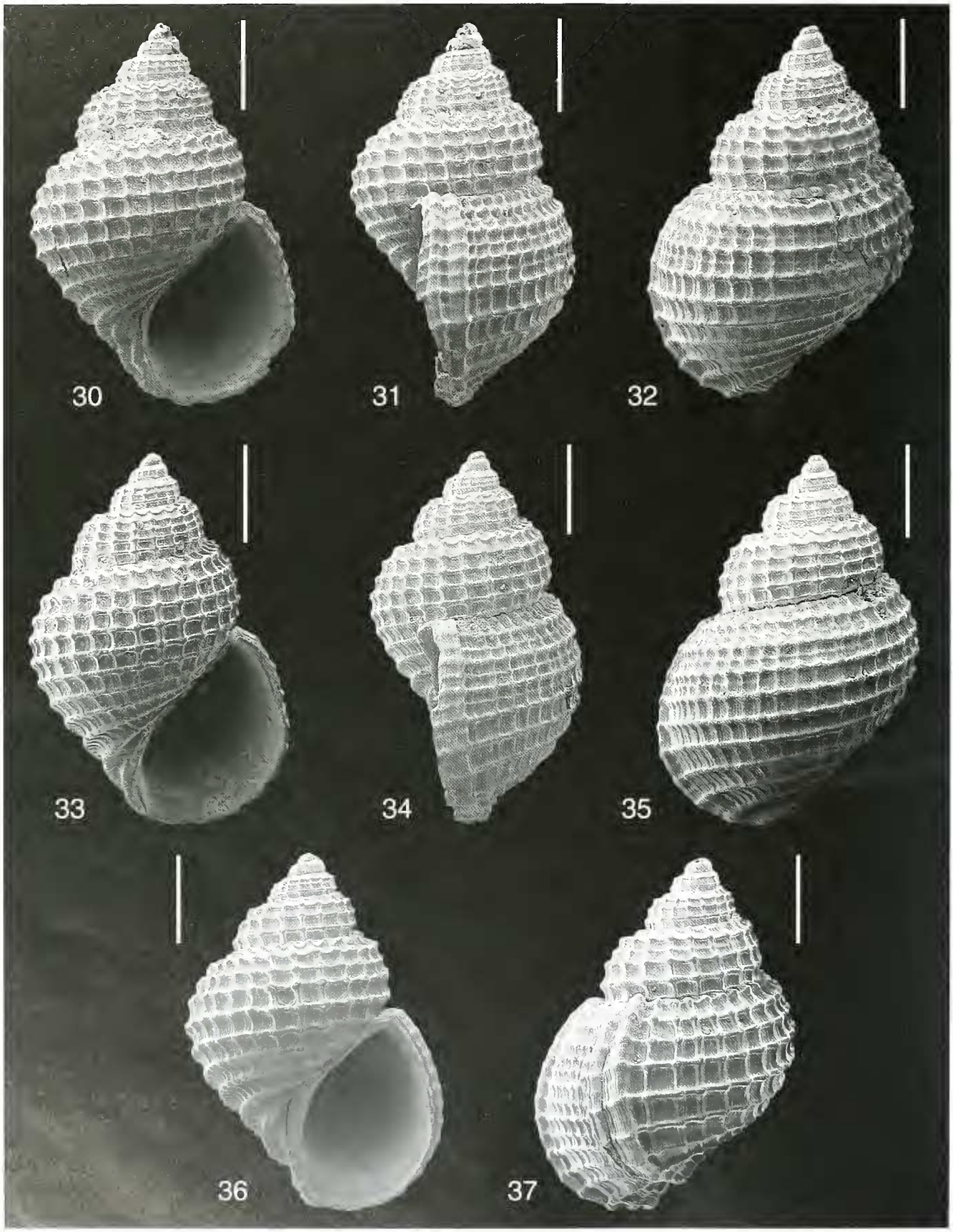
Rissoa lactea Michaud, 1830: 9–10, figs. 11–12

Rissoa (*Massotia*) *lactea* Michaud.—Bucquoy et al., 1884: 298, pl. 25, figs. 7–13

Massotia Dajerleini Monterosato *ex*-Schwartz ms, 1889: 33.

Massotia lactea (Michaud) forma *Dajerleini* Monterosato, 1917: 12.

Description: Shell sturdy, conical-ovate to cylindrical-ovate, occasionally almost pupoid, reaching 5.2 mm in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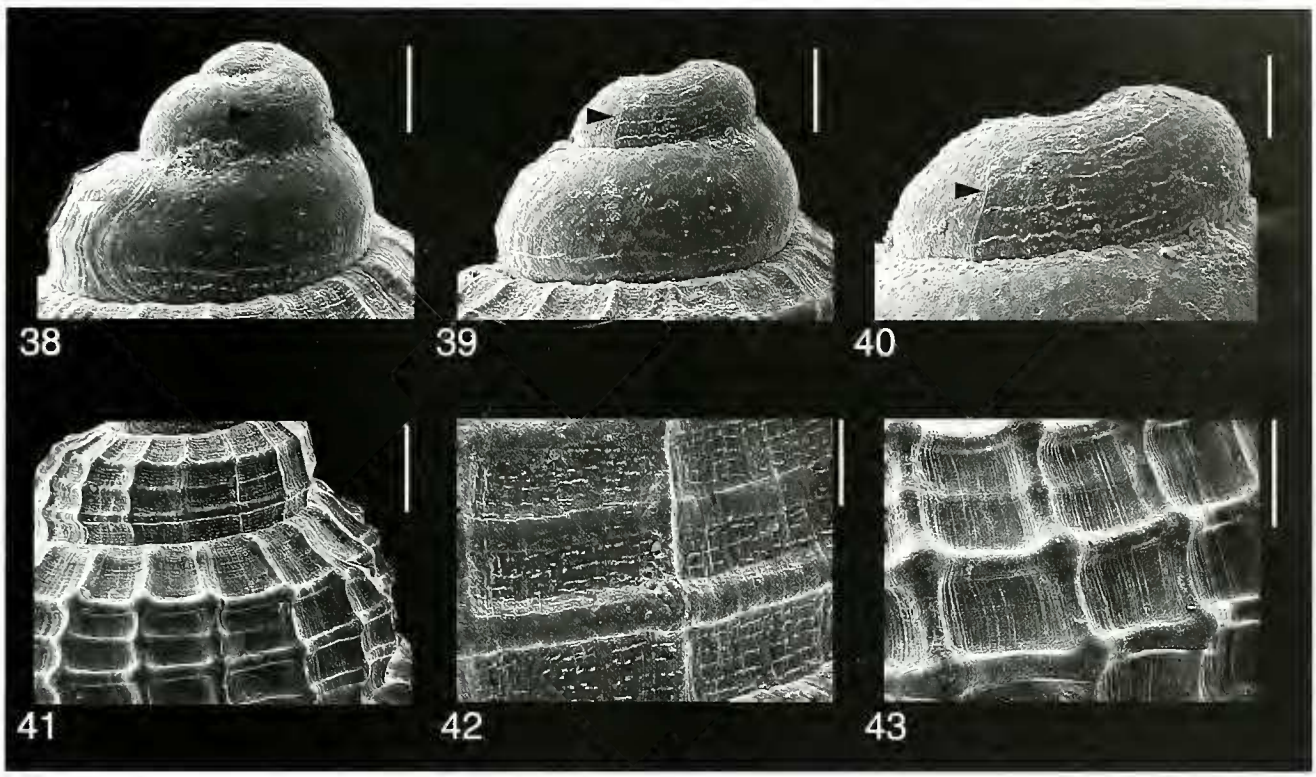
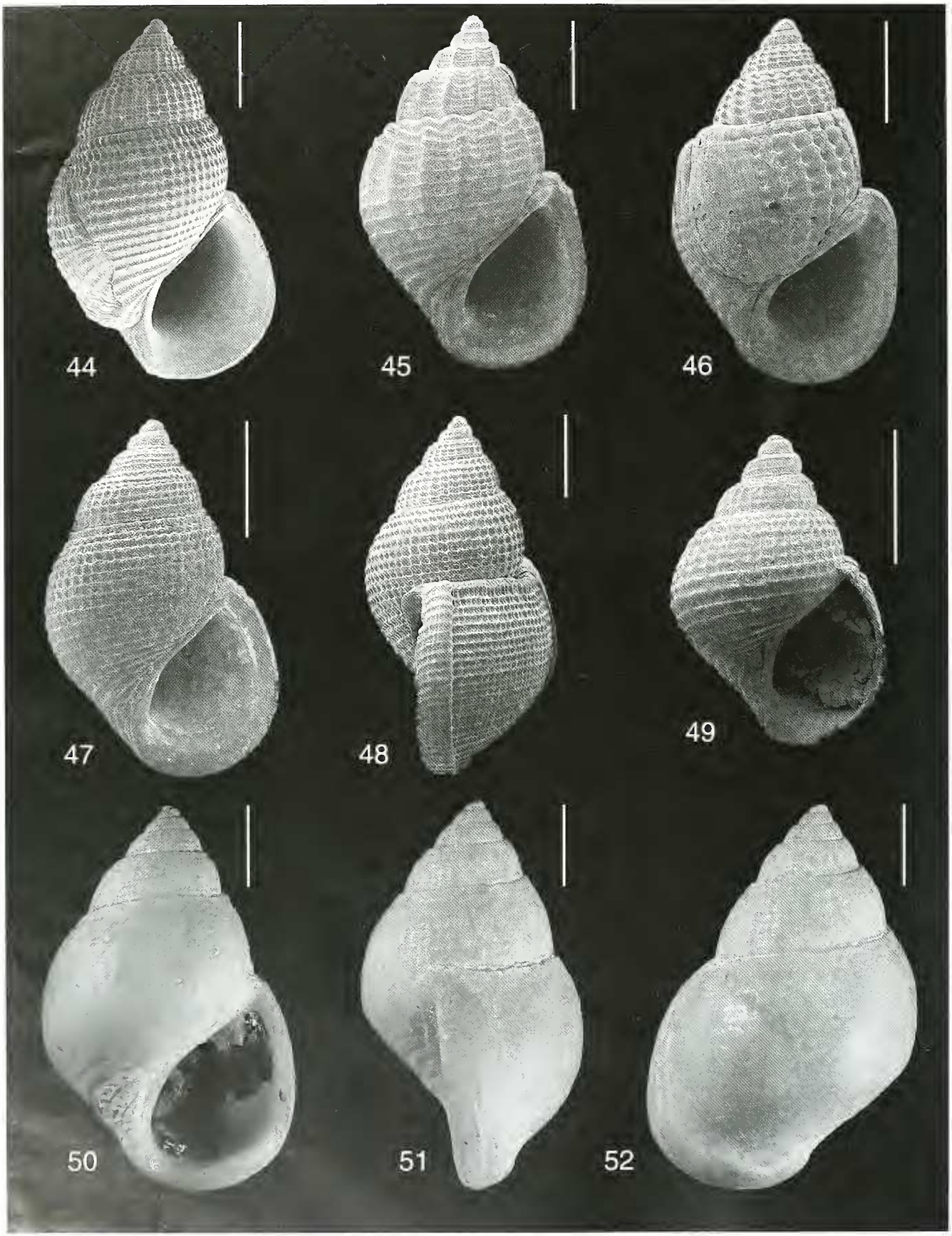


Figures 38–43. *Alvania francescoi* new species, protoconch, teleoconch sculpture and microsculpture, lower Pleistocene of Cartiera Mulino, SE Sicily, Ragusa, Vittoria. **38.** Protoconch, paratype 2. **39.** Protoconch, transition between protoconch I and II, holotype. **40.** protoconch I, holotype. **41.** Sculpture of early teleoconch whorls, note how the spiral microsculpture becomes lacking, paratype 2. **42.** Microsculpture on the first whorl, paratype 2. **43.** Detail of sculpture on the last whorl, note the numerous growth lines, paratype 4. Scale bars: 200 μm in figures 41 and 43; 100 μm in figures 38–39; 50 μm in figures 40 and 42. Black and white arrows indicate the protoconch I/protoconch II and protoconch/teleoconch boundaries, respectively.

height and 3.3 mm in width. Protoconch conical, consisting of about two convex whorls. Nucleus partially immersed. Protoconch I consisting of about 0.8 whorls, sculptured by 5–7 spiral lirae and interspersed with numerous closely packed granules, which are spirally and irregularly arranged. Protoconch II consisting of about 1.2 whorls sculptured by pimples irregular in size and arrangement. Pimples are fused into short inclined lines (opisthocline and prosocline, Figures 53–54) or form one to three discontinuous spiral ridges in abapical aspect of whorl. Protoconch/teleoconch transition well-marked and sinuous. Large shells consist of 4.2–5 weakly to rather convex whorls. These may be sculptured by a finely cancellate pattern formed by the intersection of spiral cords and numerous delicate, narrow axial ribs, or by opisthocline, pronounced ribs. Ribs often start from early whorls and are crossed by finer spiral threads. In cancellate shells, cords and ribs are equal to subequal and numbering up to nine and 40 respectively on penultimate whorl. In ribbed shells, cords and ribs are less numerous, numbering up to eight and 16 respectively on penultimate whorl. In early teleoconch whorls microsculpture consists of fine, irregular, and discontinuous spiral threads formed by groups of small granules, not covering main spiral sculpture; remaining teleoconch with a finely reticulate ultrastructure covering all primary sculpture, formed by intersection of very narrow and raised lamella-like axial ridges and very thin spiral threads. Suture slightly inclined and deeply impressed. Body whorl well-expanded, comprising ¾ of shell height. It may bear a varix, usually with angle of 180°; rarely a double varix may occur, especially in slender and cancellate shells. Aperture wide, ovate to almost pyriforme, rounded on its posterior aspect, narrowed anteriorly, comprising two thirds of last whorl height. Outer lip orthocline, internally smooth, externally thickened, mainly somewhat behind its edge, and covered by primary spiral sculpture. Sometime, in ribbed morphs, the outer lip descends vertically, so that last whorl appears rather cylindrical. Inner lip weakly arcuate, with a thin to rather

Figures 30–37. *Alvania francescoi* new species, holotype and two paratypes, lower Pleistocene of Cartiera Mulino, SE Sicily, Ragusa, Vittoria. **30–32.** Holotype, shell in apertural (30), profile (31) and dorsal (32) view. **33–35.** Paratype 3, shell in apertural (33), profile (34) and dorsal (35) view; **36–37.** Paratype 4, apertural (36) and dorsal (37) view, the last showing a double varix on the last whorl. Scale bars: 1 mm.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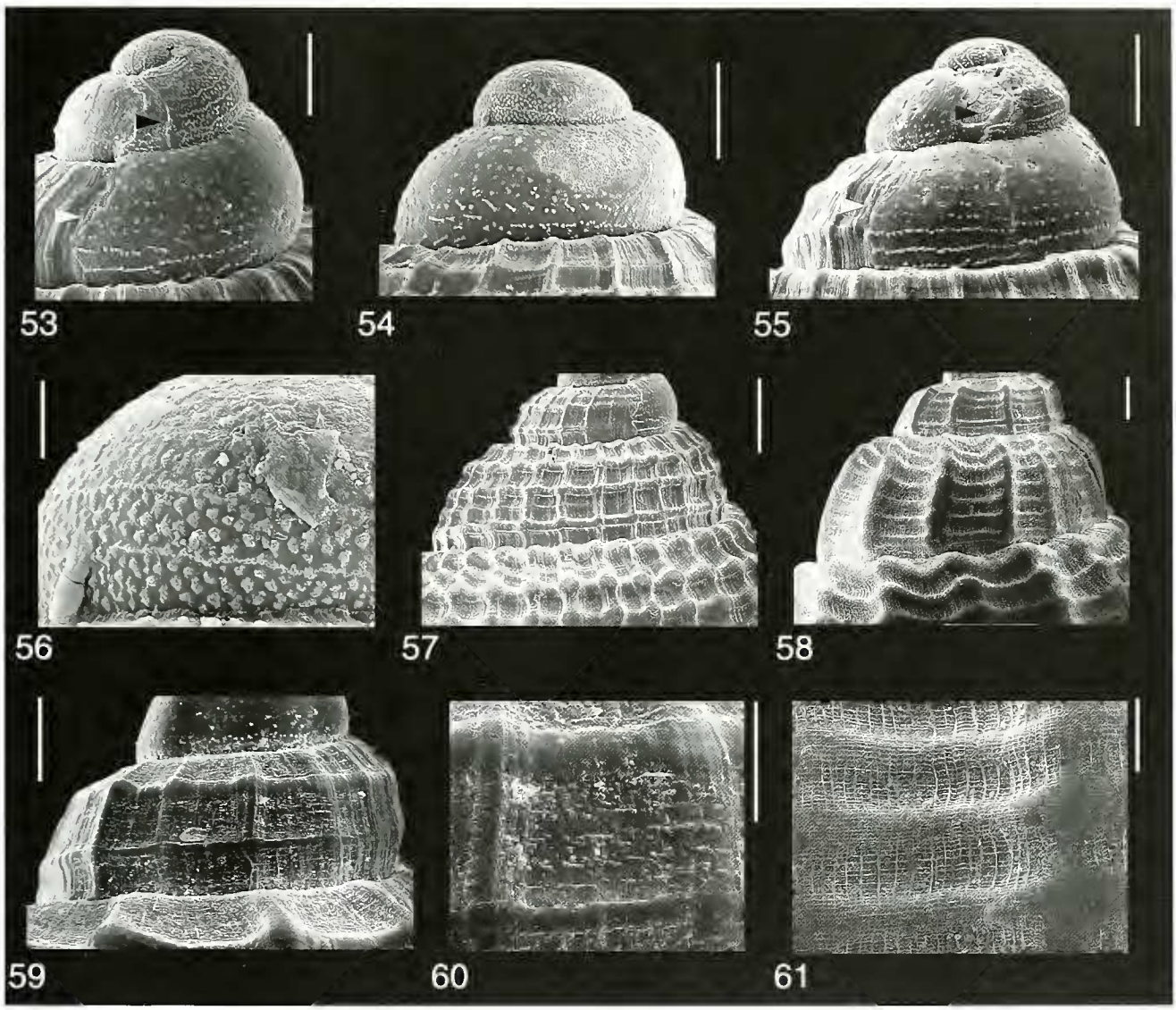


Figures 53–61. *Alvania lactea* (Michaud, 1830), protoconch and teleoconch sculpture and microsculpture. **53–54.** Profile and dorsal views of protoconch from the same shell as Figure 44, Italy, Tuscany, Siena, Poggibonsi, Villa Pietrafitta, podere Melograni, lower Pliocene, coll. MF *ex* coll. PAL (F55E). **52.** Protoconch illustrating variation of the abapical spiral ridges, Italy, Tuscany, Siena, Poggibonsi, Villa Pietrafitta, podere Sant'Uliviere, lower Pliocene, coll. MF *ex* coll. PAL (F55C). **56–57.** Sculpture of protoconch I (56) and early teleoconch whorls (57) of the same shell as figures 44 and 53–54. **58–61.** Early (58) and very early (59) teleoconch sculpture, and microsculpture of first (60) and last whorls (61), from the same shell as Figure 42, Monastir-Khenis, coll. Garilli. Scale bars: 200 μm in figures 57–58 and; 100 μm in figures 53–55, 58, 61; 50 μm in Figure 60; 20 μm in Figure 56. Black and white arrows indicate the protoconch I/protoconch II and protoconch/teleoconch boundaries, respectively.

thick narrow callus, leaving a very small umbilical chink. Very fresh shells show a ferruginous periostracum. Shell color white.

Type Locality: Michaud (1831) cited the following localities, all belonging to the French Mediterranean coast: "Agde, Cette (Hérault) [now Sète], Callioure, Port-Vendre (Pyrénées orientales)". (With this citation I consider the second edition, consulted in the MNHN-DSE

Figures 44–52. Shells of *Alvania lactea* (Michaud, 1830) and *Alvania prusi* (Fischer, 1877). **44–49.** *Alvania lactea*. **44.** Italy, Tuscany, Siena, Poggibonsi, Villa Pietrafitta, Podere Melograni, lower Pliocene, coll. MF *ex* coll. PAL (F55E), cancellated morph. **45.** Tunisia, Monastir-Khenis, coll. Garilli, ribbed morh (var. *dajerleini* Monterosato). **46.** Italy, Piemonte, Asti province, Pliocene, MGUP coll. Doderlein (113B) shell close to the original description by Michaud (1830). **47.** Italy, Piemonte, Alessandria, Tortona, Miocene (Tortonian), MGUP coll. Doderlein (476B). **48.** Profile view of the same shell as Figure 41. **49.** Juvenile shell, Mediterranean France, Provence, Marseille, La Baule, coll. PAL, (2128BAU-V00SC). **50–52.** Syntype of *Rissoa prusi* Fischer, 1877, Quaternary of Rhodes, MNHN (DHT) coll. D'Orbigny (R07495), apertural (50), profile (51) and dorsal (52) views. Scale bars 1 mm.

library, of Michaud's work "Descriptions de plusieurs . . ." published for the first time in 1830. The date 1831 may be doubtful, 1832 being the most commonly cited date; I prefer to follow Palazzi (2003), who provided helpful reasons to choose the former date.)

Material Examined: 37 shs, coll. H. Fischer, with no locality. Atlantic France: Normandy, St Aubin Calvados, 2 shs, MNHN; Normandy, St.Vaast, 1 sh., MNHN; Brittany, Finistère, Anse de Dionan, under stones covered with sand, 75 shs, MNHN legit. S. Gofas, 1973–78; Brittany, St. Lunaire, 40 shs, coll. MNHN coll. Dollfus, 1903; St. Lunaire, 15 shs, MNHN coll. Fischer; Brittany, Penthièrre, 4 shs, MNHN, P. Bouchet legit; Penthièrre (Morbihan), under stones covered with sand, low tide, 10 shs, MNHN coll. P. Bouchet; Penthièrre, 10 shs, MNHN, 27 Apr.1975; Aquitaine, Côte Basque, Hendaye, conchiferous detritus, beach, 5 shs, MNHN coll. S. Gofas, 1981; Côte Basque, Hendaye, infralittoral rocks, 3 shs, MNHN coll. S. Gofas, 1980–81; Côte Basque, Ondarroa, infralittoral rocks, 1 sh., MNHN coll. S. Gofas, 1980–81; Côte Basque, St. Sebastian, infralittoral rocks, 1 sh., MNHN coll. S. Gofas, 1980–81; Côte Basque, St Jean de Luz, infralittoral rocks, 57 shs, MNHN coll. S. Gofas, 1980–81; St Jean de Luz, outside Cape Ste Barbe, tide zone, stones covered with sand, 4 shs, MNHN coll. S. Gofas, Dec. 1988; St Jean de Luz, outside cape Ste Barbe, tide zone, stones covered with sand, 49 shs, MNHN coll. S. Gofas, 1989; St Jean de Luz, 54 shs, MNHN coll. H. Fischer, 1898; Aquitaine, Guéthary, 7 shs, MNHN coll. H. Fischer, 1898. Portugal: Algarve Sagres, Pontal dos Corvos, (37°01.3′ N, 08°58.3′ W), foot of falaise, 17–22 m, 1 sh., MNHN Missione Algarve, 05. 1988; Algarve Sagres, Baie de Baleeira, (37°00.7′ N, 08°55.0′ W), tide zone, 1 sh., MNHN Mission Algarve, May 1988. Atlantic Spain: Cantabria, Orifion prov. Santander, Punta de Sonabia, infralittoral rocks, 1 sh., MNHN coll. S. Gofas, May 1989; Asturias, Muros prov. Oviedo, playa de la Liana, infralittoral rocks, 2 shs, MNHN coll. J. Ortea-S. Gofas 08.89; Cádiz, Barbate, (36°10.9′ N, 05°56.9′ W), tide zone, infralittoral rocks, 4 shs, MNHN réc. S. Gofas Apr. 1994; Cádiz, Chiclana, (36°22.5′ N, 06°12.5′ W), tide zone, infralittoral rocks and sands, 12 shs, MNHN réc. S. Gofas, Apr. 1994; Cádiz, Barbate, conchiferous detritus, beach, 3 shs, MNHN coll. S. Gofas, 1976–81; Mediterranean Spain: Malaga, Calahonda, conchiferous detritus, beach, 9 shs MNHN coll. S. Gofas, 1976–81; Malaga, Port de Marbella, conchiferous detritus, beach, 3 shs, MNHN coll. S. Gofas, 1978–81; Malaga, Benálmadena-Costa, conchiferous detritus, beach, 3 shs, MNHN réc. S. Gofas, 1991–93. Atlantic Morocco: El Jadida, (33°16′ N, 08°29′ W), large beach, rocky platform, tide zone, 16 shs, MNHN réc. S. Gofas, 26 Sep. 1991; Fedala, Mannesmann beach, conchiferous detritus, beach, 20 shs, MNHN coll. S. Gofas, 1970–72; Asilah, mouth of Oued el Helou, conchiferous detritus, beach, 21 shs, MNHN coll. S. Gofas, 1971–72; Asilah, mouth of Oued el Helou, conchiferous detritus, beach, 30 shs MNHN coll. S. Gofas, 1972–80; Temara, (33°55′ N, 07°00′ W), Sables d'Or beach, rocks and mud, 0–2 m, 24 shs, MNHN, MA48, réc. S. Gofas, 17 Sep.1991; Essaouira (formerly Mogador), (31°31′ N, 09°47′ W), rocky platform, tide zone, 1 sh., MNHN, MA48, réc. S. Gofas, 23 Sep.1991; Rabat, Lahlou, (34°02′ N, 06°51′ W), conchiferous detritus, beach, 2 shs, MNHN réc. S. Gofas, 28 Sep. 1991; Essaouira (formerly Mogador), 4 shs, MNHN; Strait of Gibraltar, Morocco: Tanger, Grande Plage, conchiferous detritus, beach, 8 shs, MNHN coll. S. Gofas, 1970–81. Strait of Gibraltar, Spain: Ceuta Nord, Benzu, infralittoral rocks, 2 shs, MNHN coll. S. Gofas 1976–1981. Algeria: Oran, 6 shs, MNHN coll. Locard. Mediterranean France: Languedoc, Roussilion, Banyuls sur Mer, near the beach de Paulilles, infralittoral rocks, 1 sh., MNHN coll. Bouchet and Gofas, Sep. 1980; Languedoc, Roussilion, 7 shs, MNHN coll. Ph. Dautzenberg, (figured in Moll. Rouss. T. 1 pl. 35, figs.7–13); Languedoc, Roussilion, Sète, 6 shs, MNHN coll. Locard; Provence, Toulon, 8 shs, MNHN coll. Petit; Provence, Cannes, 21 shs, MNHN coll. Dollfus, 1903; Provence, east coast, Iles Embiez, passe du Gaou, under stones covered with sand, 0–1 m, 5 shs, MNHN réc. S. Gofas, Aug. 1988; Provence, east coast, Iles Embiez, (43°04.3′ N, 5°47.4′ E), passe du Gaou, under stones covered with sand, 0–3 m, 2 shs, MNHN réc. S. Gofas, Aug. 1988; Provence, Iles Embiez, (43°04.3′ N, 5°47.4′ E) passe du Gaou, rocks, photophile algae under stones covered with sand, 0–3 m, 1 sh., MNHN réc. S. Gofas, Jun. 1995; Iles Embiez, côte Nord et Petit Rouveau, infralittoral rocks, 3 shs, MNHN coll. S. Gofas, 1968–70; Provence, Les Embiez, cote Nord et Petit Rouveau, (43°05′ N, 5°47′ E), rocks, photophile algae, 0–1 m, 3 shs, MNHN réc. S. Gofas, Jun. 1995; Iles Embiez, conchiferous detritus, beach, 15 shs, MNHN coll. S. Gofas, 1968–70; Provence, St Clair, (43°08.2′ N, 6°23.2′ E), infralittoral rocks, 0–1 m, 2 shs, MNHN réc. S. Gofas, Sep. 1992; Provence, Porquerolles plage Notre Dame, (43°00.6′ N, 6°13.8′ E), rocks, 0–1 m, 1 sh., MNHN réc. S. Gofas, Sep. 1992; Provence, Le Dramont, conchiferous sand, beach, 3 shs, MNHN réc. J. Pelorce, 1992; Provence, Marseille (Endoume, 43°16.9′ N, 05°21.0′ W), littoral rocks, 1 sh., MNHN réc. S. Gofas Apr. 1995; Provence, St. Raphael, 5 shs, MNHN; Provence, Bandol, 16 shs, MNHN coll. Locard; St. Raphael, 2 shs, MNHN coll. Locard; Corsica, Ajaccio, 17 shs, MNHN coll. Jousseaume; Corsica, Algajole, 35 shs, coll. MF, 2123. Tunisia: Monastir-Khenis, beach, 1 sh., coll. Garilli, legit Garilli and Galletti 4/2000; Djerba, beach, 1 sh., coll. MF *ex* coll. C. Bogi, Jun. 1981, 2163JER. Italy: Piemonte, Asti, Baldichieri, "Grottino Monale", 20 shs, yellow sands, middle-upper Pliocene, coll. MF *ex* coll. PAL, F104A; Piemonte, Asti, 24 shs, Pliocene, MGUP coll. Doderlein, 113B; Piemonte, Alessandria, Tortona, 1 sh., Miocene, MGUP coll. Doderlein, 476B; Alessandria, Villalvernia, at the Cemetery, 1 sh., Astian yellow sands, middle-upper Pliocene, coll. MF *ex* coll. PAL, F118A; Emilia Romagna, Modena, Maranello, Fogliano, Gagliardella, Rio Grizzaga sands, 1

sh., middle Pliocene, coll. MF *ex* coll. PAL, F39A; Tuscany, Siena, Poggibonsi, Villa Pietrafitta, Podere "La Vigna", (SP 36, 4.9 km E side), 7 shs, lower Pliocene, coll. MF *ex* coll. PAL, F55B; Siena, Poggibonsi, Villa Pietrafitta, "Sbarra", (SP 36, 5.2 km), 2 shs, sands, lower Pliocene, coll. MF *ex* coll. PAL, F55D; Siena, Castelnuovo Berardenga, Terre Rosse, (SS 73, 104 km), 1 sh., sands, lower Pliocene, coll. MF *ex* coll. PAL, F36A; Siena, Poggibonsi, Villa Pietrafitta, Podere Sant'Uliviere, 27 shs, lower Pliocene, coll. MF *ex* coll. PAL, F55C; Siena, Poggibonsi, Villa Pietrafitta, Podere Melograni, 6 shs, sands, lower Pliocene, coll. MF *ex* coll. PAL, F55E; Siena, Colle Val d'Elsa, Bibbiano, 2 shs, yellow sands, lower Pliocene, coll. MF *ex* coll. PAL, F108A; Tuscany, Livorno, Tuscan Archipelago, Island of Elba, Procchio, 12 m, *Posidonia* bed, 2 shs, coll. MF *ex* coll. C. Bogi, 2120PROC; Umbria, Terni, Ficulle, quarry near Chiani river, (SS71), 1 sh., *Cidaris* marly sands, lower Pliocene, coll. MF *ex* coll. PAL, F68A; Sardinia, Nuoro, San Teodoro, 6 shs coll. PAL; Puglia, Taranto, MSNCS 44744 (*ex* 1505), 1974, BDA legit and det.; Sicily, Messina, Milazzo, Capo Milazzo, Cala S. Antonio, 12 shs, upper yellow sands, upper Pleistocene, coll. MF *ex* coll. PAL, F5A; Sicily, Catania, Grammichele, C.da Catallarga, 2 shs, coarse sands, lower Pleistocene, coll. MF *ex* coll. PAL, F27A; Sicily, Palermo, 1 sh., MNHN coll. Petit; Sicily, Palermo, 2 shs, MNHN coll. Dollfus, 1903; Palermo, Tommaso Natale, 13 shs, upper Pleistocene, MGUP 167/2/50; Palermo, Addaura, 1 sh., upper Pleistocene, MGUP 587/5/15; Sicily, Catania, 2 shs, MSNCS 44743 (*ex* 1448), 4/1974, G. Gentile legit and det.; Sicily, Siracusa, Vendicari, 1 sh., coll. PAL, 2124. Adriatic Sea: 128 shs, MNHN. Croatia: Zara, 8 shs, MNHN coll. Petit, 1873. Greece: Evvia Island (Euboea), Loukissia, 4–5 m, 1 sh., coll. PAL *ex* coll. Bogi Cesare, 2121LUC. Israel: Haifa, 9 m, 1 sh., coll. PAL *ex* coll. C. Bogi, 1994, 2164HA.

Habitat: As indicated by Jeffreys (1867), Gofas and Ponder (1991), and Bouchet (1978; 1992), this species typically lives buried under stones covered with sand at very shallow waters. I found very fresh shells collected from along all the upper part of the infralittoral stage.

Distribution: All the Mediterranean, probably decreasing abundance in eastward direction. In the eastern Atlantic it lives from the British Islands (see also Jeffreys, 1867; 1869) to Morocco. *Alvania lactea* has also been recorded from the Black Sea (Anistratenko and Starobogatov, 1994). This species probably originated in the Mediterranean Neogene, from where it is recorded from the Miocene of north Italy. It becomes more common in the western and central Mediterranean Pliocene deposits, where it is recorded from several localities of north, central, and south Italy (material herein studied; see also Sacco, 1895, and Chirli, 2006) and Spain (Estepona, Landau et al., 2004). In the Atlantic Pleistocene, as reported by Landau et al. (2004), it is recorded from the postglacial of Iceland, the North Sea Basin and the British Isles. As subfossil, it is recorded from Sweden (Hubendick and Warén, 1969). In Mediterranean, it is common from the lower-upper Pleistocene of Sicily and is also recorded from the lower Pleistocene of Tuscany (Chirli, 2006).

Remarks: This is a very variable species especially with respect to sculpture and shell shape. The typical morph, as described and figured by Michaud (1831: fig. 12), has a clathrate sculpture with the axial pattern dominating over the spiral one. The finely cancellated type, usually characterized by an elongate general shape and more convex whorls, corresponds to the forma *minor-tenuisculpta* Monterosato, 1917. Two varieties, *semiacostata* and *fusulatovaricosa* (the latter often bearing varices), were described by Sacco (1895) on similar material from the Pliocene of north Italy. This cancellate morph (Figures 44 and 47–48), which seems to be the only representation of the discussed species in the Miocene, is the most common in the Pliocene collections studied (see also Sacco, 1895: p. 28; Chirli, 2006: figs. 9–11 and 15–16) and becomes less common in Quaternary material. The markedly ribbed morph, described by Sacco (1895) as var. *laticostata* (from the Pliocene of Italy), and better known as forma *dajerleini* Monterosato, 1889, bears strong ribs, starting from the early teleoconch whorls. According to Monterosato (1917), this represents the Atlantic morph of *Alvania lactea*. I agree with Van Aatsen et al., considering it not exclusively an Atlantic morph, being present in some Mediterranean localities (see Figure 45). It is noteworthy to remember that in a extensive lot (128 shells, MNHN-DSE) from the Adriatic Sea, all the above mentioned morphs coexist.

Especially when its typical morphs are considered, *Alvania lactea* has a very characteristic ribbed, cylindrical-ovate shell and can not be confused with its congeners. Some problem might occur when considering the cancellate morph, which can be compared to the recently described Pliocene species *A. fredianii* Della Bella and Scarponi, 2000 (see this article for the main differences between the two species). The same morph of *A. lactea* shows strong similarities with the new species described herein, *A. rosariae* (see discussion below for differential diagnosis).

Alvania lactea is the type species of *Massotia* Bucquoy et al., 1884, which is considered a synonym of *Alvania* sensu stricto by Ponder (1985) on the basis of the number of the metapodial tentacles, shown by this species, based on a description by Jeffreys (1867). In my opinion, a more exhanstive anatomical dataset could be provided. Nevertheless, even on the basis of its shell features and intraspecific variation, there is no reason to consider *Massotia* as a well-supported group.

Alvania lactea has a very complicated teleoconch microsculpture, which could certainly be considered as a suite of distinctive characters, not observed in the closely-related taxa discussed in the present report. Early teleoconch whorls show a pattern similar to that observed in *A. carinata*, *A. francescoi* new species, and *A. rosariae* new species (detailed comparisons are provided

below), but the remainder of the shell is covered by very narrow, raised lamella-like axial ridges and very thin spiral threads. Also its protoconch I sculpture is rather distinctive, showing a pattern similar to that observed in *A. carinata*, *A. francescoi*, *A. rosariae*, and *A. tenera* (as well as in many other rissoids), but having a coarser ornamentation.

Alvania prusi (P. Fischer, 1877)
(Figures 50–52)

Rissoa (*Alvania*) *Prusi* P. Fischer, 1877: 80.

Description: Shell small, sturdy, conical, partially worn off, 4.7 mm in height, 3.2 mm in width. Protoconch multispiral, conical, consisting of about little more than two convex whorls. Teleoconch is formed by about four convex whorls, provided with a very delicate, cancellated sculpture almost giving a pitted shape to shell surface. This sculpture consists of moderately pronounced spiral cords crossed by apparently flat axial ribs. Spiral cords number 7–8 on penultimate whorl and 16 on body whorl; they are flatter and wider on shell base. Ribs, numbering about 40 on penultimate whorl, are lacking in basal part of last whorl. Sutures slightly inclined and deeply impressed. Last whorl well-expanded, rather angulated at the base and inflated, comprising ¾ of shell height. Aperture wide, ovate to almost pyriforme, pointed adapically, comprising ½ of the total height, ⅔ of last whorl height. Outer lip prosocline, internally smooth, externally with an almost flat, wide thickening, apparently smooth. Inner lip moderately arcuate, with a modest and narrow reflection on columellar area, leaving a very small and narrow umbilical chink (filled up with sediment).

Type Locality: Isle of Rhodes

Type Material: One syntype, R07495 in MNHN-DHT, from type locality.

Material Examined: Eastern Mediterranean Sea, Quaternary of Rhodes, type locality, MNHN-DHT (R07495), 1 sh.

Habitat: It is very difficult to characterize the paleoecological significance of this extinct species since no data about its paleoenvironment are directly available or deducible. Furthermore, Fischer (1877) provided no precise indication about the site, stratotype, and its sedimentological and paleontological nature. Considering all the other molluscan species described from Rhodes by the same author, a shallow water depositional environment (linked to the modern phanerogam infralittoral bottom) can be inferred.

Distribution: The species is known only from the type locality, and its distribution appears to be limited to the Quaternary of Rhodes.

Remarks: This taxon is practically unknown. To my knowledge, the most recent treatment is that of Monterosato (1917), who considered it as a separate species belonging to the *Massotia* group.

Alvania prusi could be confused with juvenile shells of *Alvania lactea* (the form with cancellate sculpture, see Figure 49), which exhibit a very similar body whorl profile. *Alvania prusi* is quite close to *A. fredianii* Della Bella and Scarponi (2000) from the Pliocene of Tuscany. Both species share the general shell shape and the finely reticulated sculpture, but the latter is of smaller size, has a paucispiral protoconch, deeper sutures, and a weakly denticulated outer lip (see Della Bella and Scarponi, 2000: pls. 1 and 2).

Alvania rosariae new species
(Figures 62–79)

Description: Shell small, sturdy, conical-ovate to turriform, moderately to markedly inflated, reaching about 5 mm in height, 3.5 mm in width (holotype 4 mm in height and 2.7 mm in width). Protoconch multispiral, conical, consisting of about 2–2.1 convex whorls. Protoconch I of about 0.8 whorls sculptured by 5–6 very fine spiral lirae irregularly interspersed with microscopic granules. Protoconch/teleoconch transition well marked and sinuous adapically. Protoconch II sculptured by spirally arranged microscopic pimples (stronger in adapical portion) forming one to two spiral threads, the lower very close to the suture, occurring on last whorl. Teleoconch formed by about 4.2 usually very convex whorls, sculptured by numerous axial ribs and slightly stronger spiral cords. The latter, rapidly increasing in count, number 2–6, 6–10 (rarely 11), and 26–34 (in specimens higher than 3.5 mm) on the first, penultimate, and last whorl of the teleoconch, respectively. Some secondary, less marked cords may occur on last whorl, usually close to the outer lip. The adapical one, two, and three spiral cords on first, penultimate and body whorl, respectively are more pronounced. In specimens higher than 3.5 mm, axial sculpture consists of 44–60 narrow ribs (52 in holotype) on the penultimate whorl. Ribs become narrower and lamella-like to obsolete or lacking on shell base, particularly close to columella. The same may occur on the terminal portion of the body whorl (Figure 66). The intersection of spiral cords with axial ribs gives a characteristic cancellate and gently nodular shape, forming a rectangular (almost equilateral in the central portion of the body whorl) pattern. The long axis of these rectangles is perpendicular to the shell axis on the central and abapical portion of whorls and parallel on upper part. Microsculpture consists of very fine, sometime irregularly interspersed, spiral lirae (Figure 77). These become obsolete on the penultimate and body whorls, where numerous, very fine and narrow ribs (possible growth lines) occur. Lirae are continuous only on adapical portion of early teleoconch whorls and never cover primary spiral sculpture. Sutures slightly inclined and rather deeply impressed. Last whorl well-developed, comprising about ⅔ to ⅘ of the shell height, usually with a very convex profile. It sometime bears one or two close varices which

may form angles of 10° to 210°. Aperture wide, ovate, comprising ½ to ⅗ of the total height; ⅔ to ¾ of last whorl height. Outer lip orthocline (slightly curved), internally smooth, externally markedly thickened close to lip edge and covered by spiral cords. Inner lip moderately arcuated and rather thickened in the columellar area, where a very narrow umbilical chink occurs.

Type Locality: Lower Pleistocene of Cartiera Mulino (36°56′57″ N, 14°34′03″ E), Vittoria, Ragusa, southeastern Sicily. The stratotype is the 3D1 layer of Costa (1989).

Type Material: Holotype (4.0 × 2.7 mm), DGUP CMRG 12/496, coll. Garilli; Paratype 1 (4.6 × 3.2 mm), ZMA Moll. 4.07.014 (*ex* CMRG 13/497 coll. Garilli); paratype 2 (not-complete shell, 3 mm width), ZMA Moll. 4.07.08 (*ex* CMRG 014/498 coll. Garilli); paratype 3 (3.6 × 2.55 mm), DGUP CMRG 15/499, coll. V. Garilli; paratype 4 (4.5 × 3.3 mm), DGUP CMRG 16/500, coll. Garilli; paratype 5 (3.8 × 2.5 mm), MNHN A25951 (*ex* CMRG 17/501, coll. Garilli); paratype 6 (3.85 × 2.75 mm), ZMB MB.Ga.2480 (*ex* CMRG 18/502, coll. Garilli); paratype 7 (3.6 × 2.4 mm), ZMB MB.Ga.2481 (*ex* CMRG 19/503, coll. Garilli); paratype 8 (3.8 × 2.6 mm), DGUP CMRG 20/504, coll. Garilli; paratype 9 (3.6 × 2.6 mm), DGUP CMRG 21/505, coll. Garilli; paratype 10 (3.95 x 2.6 mm), DGUP CMRG 22/506, coll. Garilli; paratype 11 (4.2 × 2.75 mm), DGUP CMRG 23/507, coll. Garilli; paratype 12 (3.7 × 2.55 mm), DGUP CMRG 24/508, coll. Garilli; paratype 13 (3.9 × 2.5 mm), DGUP CMRG 25/509, coll. Garilli; paratype 14 (3.7 × 2.55 mm), DGUP CMRG 26/510, coll. Garilli; paratype 15 (3.5 × 2.6 mm), DGUP CMRG 27/511, coll. Garilli; paratype 16 (4 × 2.6 mm), DGUP CMRG 28/512, coll. Garilli; paratype 17 (3.9 × 2.7 mm), DGUP CMRG 29/513, coll. Garilli; paratype 18 (3.6 × 2.45 mm), GNHM ID 30.706 (*ex* KIGR 3/514 coll. Garilli); paratype 19 (4 × 2.7 mm), GNHM ID 30.707 (*ex* KIGR 4/515 coll. Garilli); paratype 20 (4.5 × 2.7 mm), GNHM ID 30.708 (*ex* KIGR 5/516 coll. Garilli); paratype 21 (4.7 × 3.4 mm), GNHM ID 30.709 (*ex* KIGR 6/517 coll. Garilli); paratype 22 (4.4 × 2.9 mm), GNHM ID 30.710 (*ex* KIGR 7/518 coll. Garilli); paratype 23 (4 × 2.55 mm), GNHM ID 30.711 (*ex* KIGR 8/519 coll. Garilli); paratype 24 (3.35 × 2.5 mm), GNHM ID 30.712, (*ex* KIGR 9/520 coll. Garilli); paratype 25 (2.9 × 1.95 mm), GNHM ID 30.713 (*ex* KIGR 10/521 coll. Garilli); paratype 26 (not-complete shell), GNHM ID 30.714 (*ex* KIGR 11/522 coll. Garilli); paratype 27 (4.15 × 2.65 mm), GNHM ID 30.715 (*ex* KIGR 12/523 coll. Garilli); paratype 28 (4.0 × 2.6 mm), GNHM ID 30.716 (*ex* KIGR 13/524 coll. Garilli); paratype 29 (not-complete shell, 3.85 mm), GNHM ID 30.717 (*ex* KIGR 14/525 coll. Garilli); paratype 30 (2.7 × 1.9 mm), GNHM ID 30.718 (*ex* KIGR 15/526 coll. Garilli); paratype 31 (3 × 2.05 mm), GNHM ID 30.719 (*ex* KIGR 16/527 coll. Garilli); paratype 32 (3.8 × 2.5 mm), GNHM ID 30.720 (*ex* KIGR 17/528 coll. Garilli); paratype 33 (3.55 × 2.5 mm), GNHM ID 30.721 (*ex* KIGR 18/529 coll. Garilli); paratype 34 (4.05 × 2.8 mm), GNHM ID 30.722 (*ex* KIGR 19/530 coll. Garilli); paratype 35 (4.95 × 3.25 mm), GNHM ID 30.723 (*ex* KIGR 20/531 coll. Garilli); paratype 36 (not measured), GNHM ID 30.724 (*ex* KIGR 21/532, coll. Garilli); paratype 37 (not measured), GNHM ID 30.725 (*ex* KIGR 22/533, coll. Garilli). Holotype and Paratypes 4–17, from the lower Pleistocene of Cartiera Mulino, 3D1 bed of Costa (1989), Vittoria, Ragusa, southeastern Sicily. Paratypes 1–3 from the same locality, 3D2 bed of Costa (1989). Paratypes 18–22 and 24–35 from the middle to upper Pleistocene of Kyllini, northwestern Peloponnesus, N2 and H6 beds of Garilli et al. (2005a), respectively. Paratypes 36 and 37, same locality, from the lower to early middle Pleistocene P3 layer of Garilli (2005b) and from a late lower Pleistocene yellowish to reddish sandy layer about 50 m underlying the F14 bed of Garilli and Galletti (2007), respectively.

Another four, uncatalogued paratypes are housed in DSTC (1 sh. from 3D1, 1 sh from 3D2 and 2 shells from 3C bed of Costa, 1989, all from the lot n° 18, as *Galeodina carinata* (Da Costa). One more uncatalogued paratype (*ex* CMRG 030/534 coll. Garilli), from the type locality, 3D1 layer, is in coll. MF (Prato).

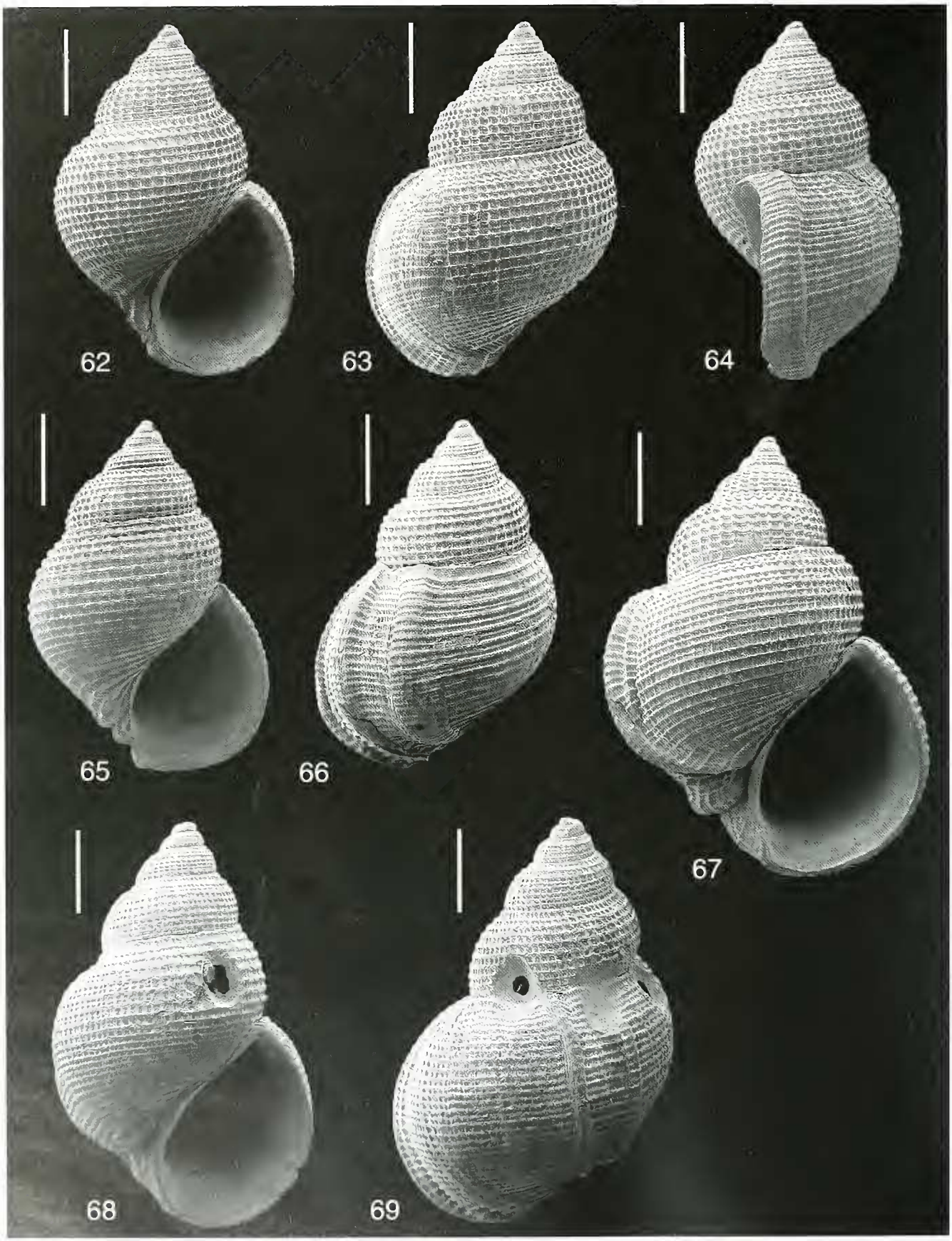
Etymology: The species is dedicated to my wife Rosaria.

Material Examined: The type material from the lower Pleistocene of Cartiera Mulino, Vittoria, Ragusa, SE Sicily, 18 shs, and from the late lower (1 sh., from a reddish to yellowish sandy bed about 50 m underlying the F14 bed of Garilli and Galletti, 2007), lower to middle (2 shs, layer P3 of Garilli et al, 2005b), and middle to upper Pleistocene (13 shs, layer H6; 4 shs, layer N2) of Kyllini, Elea, NW Peloponnesus, Greece.

Habitat: In the type locality, the species was mainly recovered from the layers 3D1 and 3D2 which were linked to the ecotone SVMC-HP (sensu Pérès and Picard, 1964) by Costa (1989). In the Kyllini sites, this species was found in cerithids-trochids-rissoids assemblage linked to the present biocenosis HP, characterized by the phanerogam *Posidonia oceanica* (Linnaeus) Delile, 1813 (See Garilli et al. (2005a); Garilli et al. (2005b), and Garilli and Galletti (2007) for more detailed information about the paleoecological characteristics of the cited Kyllini strata.)

Distribution: The species has a lower to middle-upper Pleistocene stratigraphic range, presently limited to SE Sicily and NW Peloponnesus, being recorded from the lower Pleistocene of Sicily (type locality) and from the lower to upper Pleistocene deposits of Kyllini, Greece (NW Peloponnesus).

Remarks: *Alvania rosariae* represents a sort of intermediate form between *A. carinata* and *A. lactea* (cancellate form). Compared with the former taxon, it shows some similarities in the type of intraspecific variation, showing very inflated to quite elongate shells (compare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Figures 68–69 with the "form" *ecarinata* of *A. carinata*, Figures 1, 4, 5), in usually bearing varices, and in the microsculpture of the early teleoconch. In addition, their respective larval shells do not show relevant differences. *Alvania rosariae* new species can be distinguished by absence of a keeled shape, having subequal and more numerous spiral and axial sculptural elements. The cancellate form of *A. lactea* is comparable with *A. rosariae* new species, having a very similar sculpture and occasionally a similar shell shape (only in the very ovate morph, e.g. Figures 44, 47 and 65–66). However, *A. rosariae* new species differs by having more convex whorls and a very different microsculptural pattern, with only irregular, fine, often interrupted spiral threads covering the early teleoconch whorls. Furthermore, the protoconch I of *A. lactea* bears a coarser sculpture, consisting of more numeorus and larger pimples and much more elevated spiral lirae.

Alvania rosariae new species can also be compared with *A. francescoi* new species: both species have a galeodiniform shape, a similar microsculpture, and share a very similar sculptural pattern on the protoconch. Differences between the two species are mainly found in the teleoconch sculpture, which is strongly nodular and coarser in *A. francescoi* new species; furthermore the latter has fewer spiral cords and axial ribs.

Alvania rosariae new species may resemble *A. magistra* Chirli, 2006, an interesting galeodiniform species from the Pliocene of N Italy and S Spain (Chirli, 2006: pl. 11, figs.13–16 and pl. 12, figs.1–8; Landau et al., 2004: pl. 10, figs.3a–e, as *Alvania* sp.), showing a quite similar finely cancellate sculpture, especially in the arrangement of the adapical cords, and a quite wide, ovate aperture. However, the latter species shows an unusual outer lip profile, having a wide sinus at the upper aspect, its protoconch I shows a netted *Manzonia*-like sculpture, while protoconch II appears less sculptured than in *A. rosariae* new species

Alvania tenera (Philippi, 1844)
(Figures 80–89)

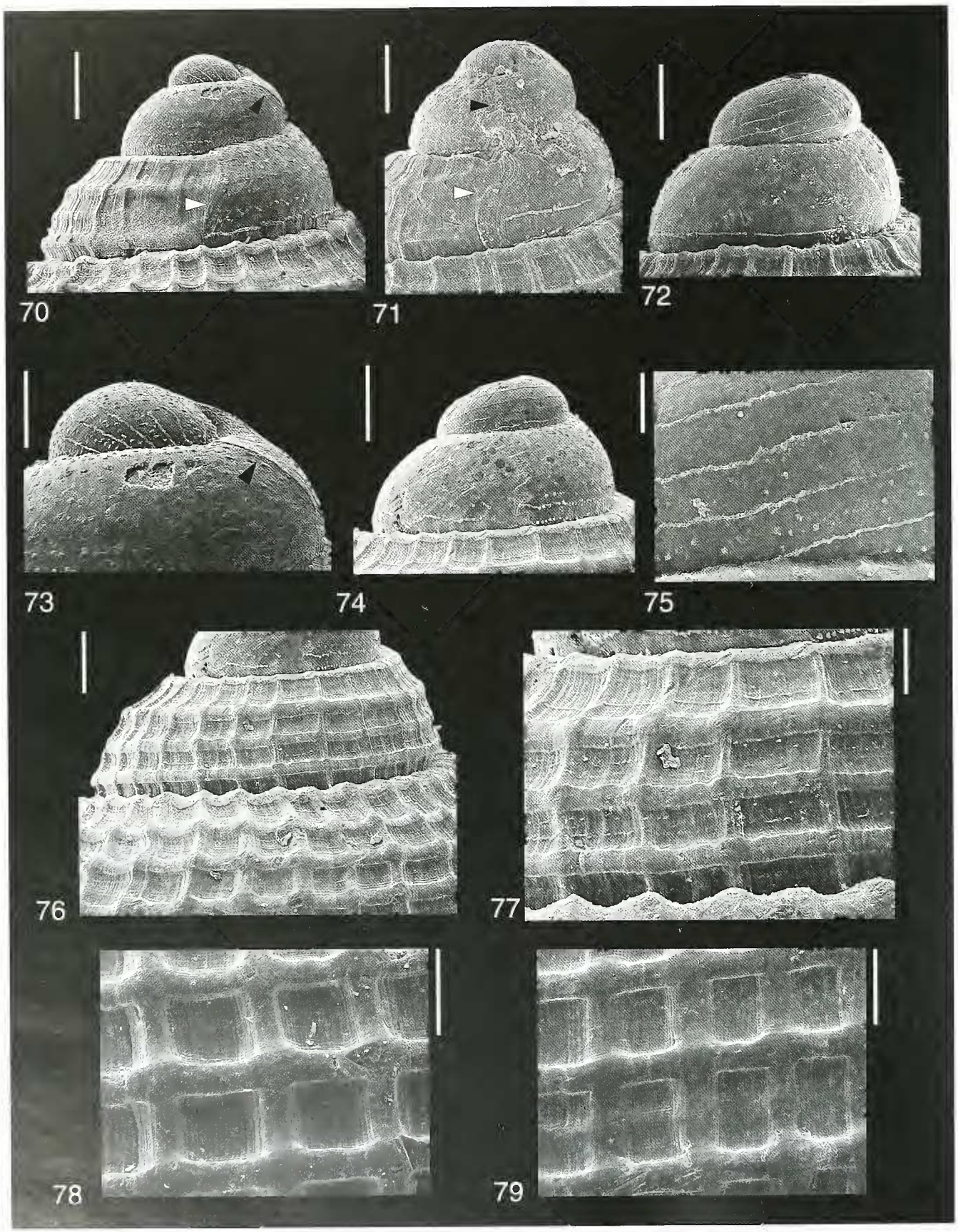
Rissoa tenera Philippi, 1844: 128–129, pl. 23, fig. 15.
Galeodina tenera (Philippi, 1844).—Piani, 1979: 71, fig. 4

Description: Shell minute, conical, and subcarinate, to conical-ovate or elongate, moderately to markedly sturdy, reaching 2.2 mm in height and 1.4 mm in width. Protoconch multispiral, conical, with 2–2.3 convex whorls. Protoconch I consists of about 0.8 whorl, sculptured by six very thin spiral lirae and a few microscopic granules between them. Protoconch II is sculptured by a few to abundant very small granules. These are more numerous on last half whorl, where they are spirally arranged, forming very discontinuous and irregular ridges. Protoconch/ teleoconch transition distinct, with a slight (to very slight) sinuosity. Teleoconch consists of 3–3.5 weakly to discretely convex whorls, quite variable in width. These are sculptured by well-raised, narrow, spiral, occasionally almost keel-like cords (in quite conical shells), which overide the axial sculpture. They number 3–4, 4–5, and 12–13 on first, penultimate, and body whorl, respectively. Usually, weaker cords are present on shell base or close to upper suture. Axial sculpture formed by very narrow, prosocline, rows of short segments, forming discontinous ribs, occurring between spiral cords and becoming very thin to lacking toward shell base. Ribs number 40–60 on last whorl. At the intersections with axial elements, spiral cords generally appear very finely nodular (Figure 86). Last whorl well-expanded, with a rather rounded profile, sometimes inflated, comprising about ⅔ to ¾ (in subcarinate and conical shells) of total shell height. Aperture ovate, anteriorly rounded, posteriorly angulated, comprising about ½ and ⅔ of total shell and last whorl height, respectively. Outer lip rounded, markedly prosocline, thin, internally smooth, externally with no thickening. Inner lip weakly arcuate, with a thin and narrow (Figure 82) to stronger and wider (Figure 80) callus, leaving a very narrow umbilical chink. Coloration usually consists of reddish to brown spots on a cream-whitish or (rarely) brownish background.

Type Locality: Peninsula of Magnisi (originally indicated as "Peninsula Thapsum" from the old Greek name of Magnisi), Siracusa, southeastern Sicily.

Material Examined: Atlantic: Canary Islands, Tenerife, Pal-Mar, 6–8 m, 1 sh., MNHN coll. P. Bouchet, 15 Jul. 1980; Morocco: Asilah, mouth of Oued el Helou, conchiferous detritus, beach, 9 shs, MNHN coll. S. Gofas, 1971–72; El Jadida, (33°16′ N, 08°29′ W), large beach, conchiferous detritus, beach, 5 shs, MNHN réc S. Gofas, 26 Sep. 1991; El Jadida, (33°16′ N, 08°29′ W), large beach, tide zone, 4 shs, MNHN réc S. Gofas, 26 Sep.1991. Strait of Gibraltar: Spain, Cadiz, conchiferous detritus, beach, 2 shs, MNHN coll. S. Gofas, 1976–81; Cadiz, Tarifa, beach, 4 shs, coll. PAL *ex* coll. C. Bogi, Jun. 1986, 2030TAR; Cadiz, Tarifa, Torre de la Peña, conchiferous detritus, beach, 3 shs, MNHN coll. S. Gofas, Aug. 1981; Morocco, Tanger, Grande Plage, conchiferous detritus, beach, 1 sh., MNHN coll. S. Gofas, 1970–81. Mediterranean: Spain, Andalusia, Punta della Mona, 43 m, 3 shs, coll. PAL *ex* coll. C. Bogi, 2032PMO; Spain, Málaga, industrial dredging, 20–40 m, 1 sh., MNHN réc.

Figures 62–69. *Alvania rosariae* new species, holotype and paratypes 16, 21, and 35. **62–63.** Apertural (62), dorsal (63) and profile (64) views of holotype, lower Pleistocene of Cartiera Mulino, bed 3D1 of Costa (1989), SE Sicily, Ragusa, Vittoria. **65–66.** Paratype 16, dorsal (65), illustrating varices on the last whorl, and apertural (66) view, same site and locality. **67.** Paratype 21, a very inflated last whorl and a strong varix opposite the outer lip, middle to upper Pleistocene of Kyllini, NW Peloponnesus, N2 bed of Garilli et al. (2005a). **68–69.** Apertural (68) and dorsal (69) view of paratype 35, showing a quite slender shell, middle to upper Pleistocene of Kyllini, northwestern Peloponnesus, H6 bed of Garilli et al. (2005a). Scale bars 100 μm.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S. et C. Gofas, May 1991; Malaga, Calahonda, conchiferous detritus, beach, 1 sh., MNHN coll.S. Gofas, 1976–81; Malaga, Benalmádena, conchiferous detritus, beach, 6 shs, MNHN réc S. Gofas, 1991–93; Malaga, Mijas, detritus, 10 m, 4 shs, coll. Stefano Rufini; Malaga, Cabo Pino, detritus, 10 m, 2 shs, coll. SR, (41.80g); Morocco, Cabo Negro, beach, 1 sh., MNHN coll. S. Gofas, det. W. Ponder, 1986; France, Provence, Marseille, Curry, beach, 3 m, 2 shs, coll. PAL *ex* coll. C. Bogi, Jun. 1986, 2037MAR; Provence, Marseille, La Baule, small beach at 25 km west from Marseille, 9 shs, coll. PAL *ex* coll. C. Bogi, Oct. 1986, 2035BAU; Provence, Le Dramont, (43°24.7′ N, 6°51.7 E), 22–30 m, 26 shs, MNHN réc. J. Pelorce, 1992; Provence, Les Embiez, cote Nord et Petit Rouveau, (43°05′ N, 5°47′ E), rocks, algae, 0–1 m, 11 shs, MNHN réc S. Gofas, Jun. 1995; Provence, Marseille, Cap Morgiou, "calque de la Triperie," (43°12.2′ N, 05°26.9′ E), muddy sand , inside cavity, 22 m, 4 shs, MNHN réc H. Zibrowius, Jun. 1996; Provence, Marseille, Grand Congloue, (43°10.6′ N, 05°24.2′ E), 33 m, 50 shs, MNHN réc. H. Zibrowius, Jun. 1996; Provence, Les Embiez, passe du Gaou, rocks, photophile algae, (43°04.3′ N 5°47.4′ E), 0–3 m, 1 sh., MNHN réc S. Gofas, Jun. 1995; Provence, St. Clair, infralittoral rocks, (43°08.2′ N 6°23.2′ E), 0–1 m, 1 sh., MNHN réc. S. Gofas, Sep. 1992; Tunisia, Sfax, 4 shs, MNHN coll. Staadt, 1969; Italy, Liguria, Portofino, 1 sh., coll. PAL, 2038; Italy, Tuscany, Livorno, Antignano, 0.5 m, brown algae on rocks, 1 sh., coll. PAL legit Bogi, Apr. 1999, 2029; Livorno, under littoral rocks, 0.5–1.0 m, 5 shs, coll. PAL *ex* coll. C. Bogi, 2039LIV; Livorno, Meloria, 10–30 m, 3 shs, coll. PAL *ex* coll. C. Bogi, 1995, 2031MEL; Livorno, Tuscan Archipelago, Island of Elba, Capoliveri, 32 m, 2 shs, coll. PAL *ex* coll. C. Bogi, Aug. 1994, 2036CAPOL; Tuscan Archipelago, Gemini Island, (southern side of Island of Elba), 11 m, 3 shs, coll. PAL, 2034; Tuscan Archipelago, Isola del Giglio, Punta Fenaia, 32 m, 1sh., coll. medshells.com *ex* coll. G. Ruggieri; Tuscany, Grosseto, Argentario, 25 m, 1 sh., coll. medshells.com *ex* coll. G. Ruggieri, Jul. 1988; Italy, Lazio, Ostia, Tor Paterno, 33 m, 5 shs, coll. medshells.com *ex* coll. G. Ruggieri; Lazio, Roma, Santa Marinella, *ex* reti, 2 shs, coll. medshells.com *ex* coll. G. Ruggieri; Italy, Sardinia, Oristano, Santa Caterina di Pittinurri, 5 m, 3 shs, coll. PAL *ex* coll. C. Bogi, 30 Aug. 1986, 2040SCP; Sardinia, Sassari, Island of Maddalena, beach, 3 shs coll. PAL *ex* coll. C. Bogi, 2028IMA; Sardinia, Nuoro. Sant'Antioco, Cala Lunga, 20 shs, coll. medshells.com *ex* coll. G. Ruggieri, 03.1989; Italy, Campania, Peninsula of Sorrento, Punta Penna, 2 shs, coll. medshells.com *ex* coll. G. Ruggieri, 1988; Italy, Sicily, Palermo, 2 shs, MNHN coll. Locard; Sicily, 1 sh., MNHN coll. Petit, 1873; Palermo, 3 shs, ZMB *ex* coll. Monterosato, 81013 (originally labelled by Monterosato as *Cingula tenera*, 3, 1125, Palermo); Palermo, Arenella, 2 shs, ZMB *ex* coll. Monterosato, 81014, (originally labelled by Monterosato as "*Cingula tenera* var . . . , 2, Arenella, Palermo"); Sicily, Siracusa, Capo Passero, 16 m, 3 shs, coll. medshells.com *ex* coll. G. Ruggieri, 05 Sep. 1987.

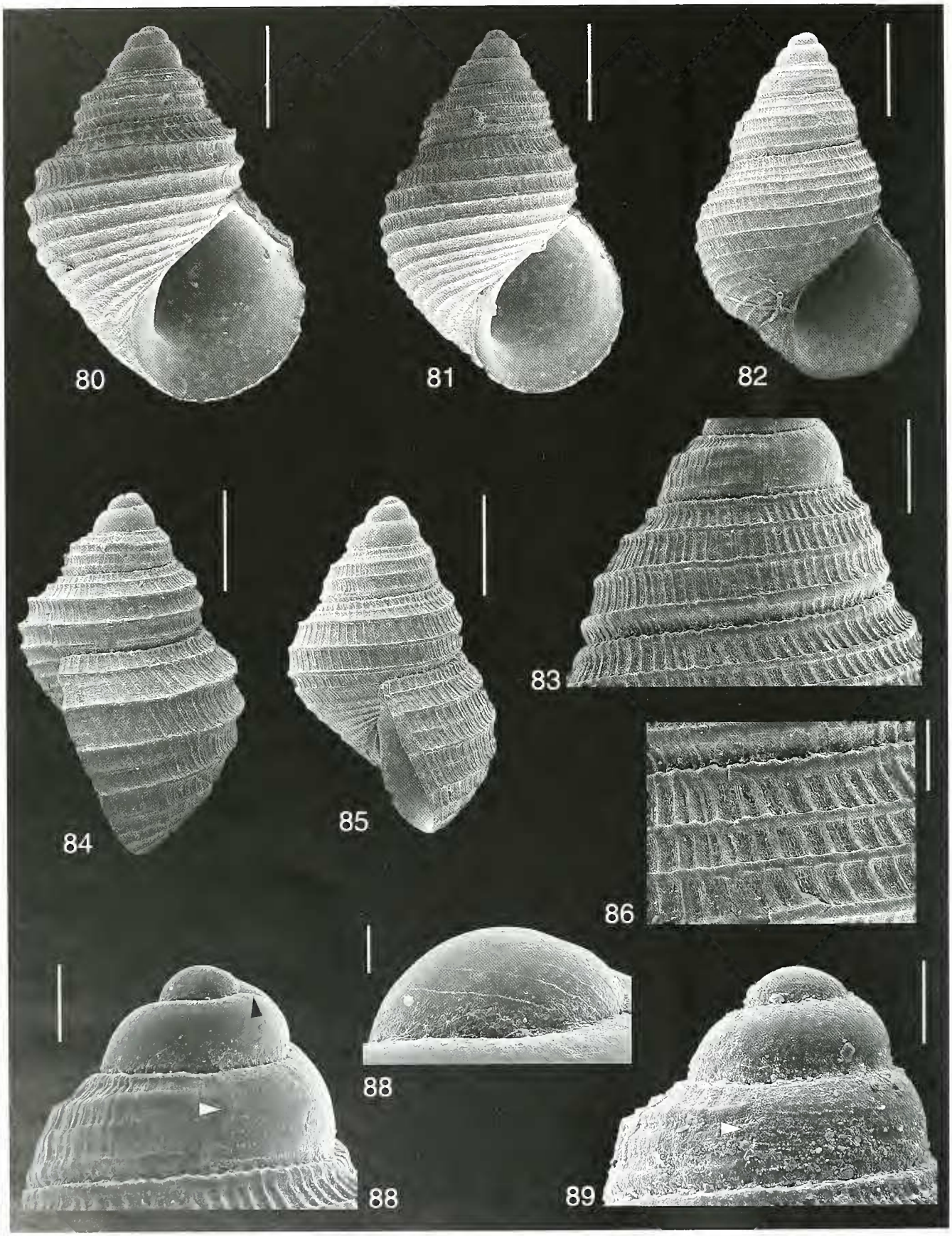
Habitat: This species is clearly limited to infralittoral depths. In the upper part of its distribution, it seems to live in very shallow waters, on algae. It likely lives also in the cavities occurring in infralittoral muddy sandy bottoms.

Distribution: In the western and central Mediterranean the species seems to be well distributed; Adriatic and eastern Mediterranean occurrences should be verified. In the Atlantic it lives along the Moroccan coasts and in the Canary Islands. To my knowledge, there is no fossil record of this species.

Remarks: This small species is characterized by having a variable shell shape and sculpture. The conical shells, bearing a strongly cingulated sculpture, which markedly prevails over the axial, are comparable with typical keeled morph of *Alvania carinata*. In addition, *Cingula* species provided with a strong spiral sculpture are comparable to *A. tenera*. The ovate, slender shells of this last species, with a finely cingulated sculptural pattern, might vaguely resemble some species of *Setia* H. and A. Adams, 1854. As a consequence, Piani (1979) and Van Aartsen (1982) included *A. tenera* in *Galeodina*, whereas Nordsieck (1968; 1972) placed the same species in *Setia* and *Cingula* respectively. The last two views should not be accepted. In fact, the species of *Setia* have a smooth or very slightly sculptured shell with more convex whorls than *A. tenera*, and *Cingula* species are characterized by shells usually lacking axial sculpture and having a very thick outer lip.

The shells from eastern Atlantic (Canary Islands and Morocco) do not show meaningful differences from the Mediterranean ones studied. With regard to the resemblance between *A. tenera* and *A. carinata*, it is manifest in the keeled, conical-inflated shell shape shown by their typical respective morphs, and in having a quite wide and developed aperture. However *A. tenera* never shows va-

Figures 70–79. *Alvania rosariae* new species **70.** Protoconch of the holotype, lower Pleistocene of Cartiera Mulino, bed 3D1 of Costa (1989), SE Sicily, Ragusa, Vittoria. **71.** Protoconch of paratype 16, showing variation of the abapical ridges on protoconch II, same locality and bed. **72.** Dorsal view of protoconch of paratype 21, showing protoconch I sculpture and the abapical ridges on protoconch II, middle to upper Pleistocene of Kyllini, NW Peloponnesus, N2 bed of Garilli et al. (2005a). **73–74.** Holotype, detail of early protoconch (73) showing sculpture of protoconch I and protoconch I/protoconch II boundary, and dorsal view of protoconch (74). **75.** Sculpture of protoconch I, paratype 21. **76–79.** Holotype, detail of teleoconch sculpture: early whorls (76), first to second whorl (77), showing microsculpture, penultimate to last whorl (78), showing the microscopic incremental scars, and last whorl (79). Scale bars: 100 μm in Figures 70–72, 74, 76 and 78–79; 50 μm in Figure 77; 20 μm in Figure 75. Black and white arrows indicate the protoconch I/protoconch II and protoconch/teleoconch boundaries, respectively.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rices, bears a very delicate axial sculpture, its outer lip is always very thin, and usually has more colored shells.

Genus *Galeodinopsis* Sacco, 1895

Type Species: *Rissoa tiberiana* Coppi, 1876 by original designation.

Galeodinopsis tiberiana (Coppi, 1876)
(Figures 81–99)

1862 *Rissoa tuba* Doderlein, 1862: 17 (*nomen nudum*)
1876 *Rissoa Tiberiana* Coppi, 1876: 201–202.
Manzonia fariai Rolán and Fernandes, 1990: 64–65, pl. 1, figs. 4–6.
Alvania fariai (Rolán and Fernandes, 1990).—Gofas, 1999: 88–89, figs. 39–42.
Alvania fariae (Rolán and Fernandes, 1990).—Landau et al., 2004: 41, pl. 7, figs. 3–4.

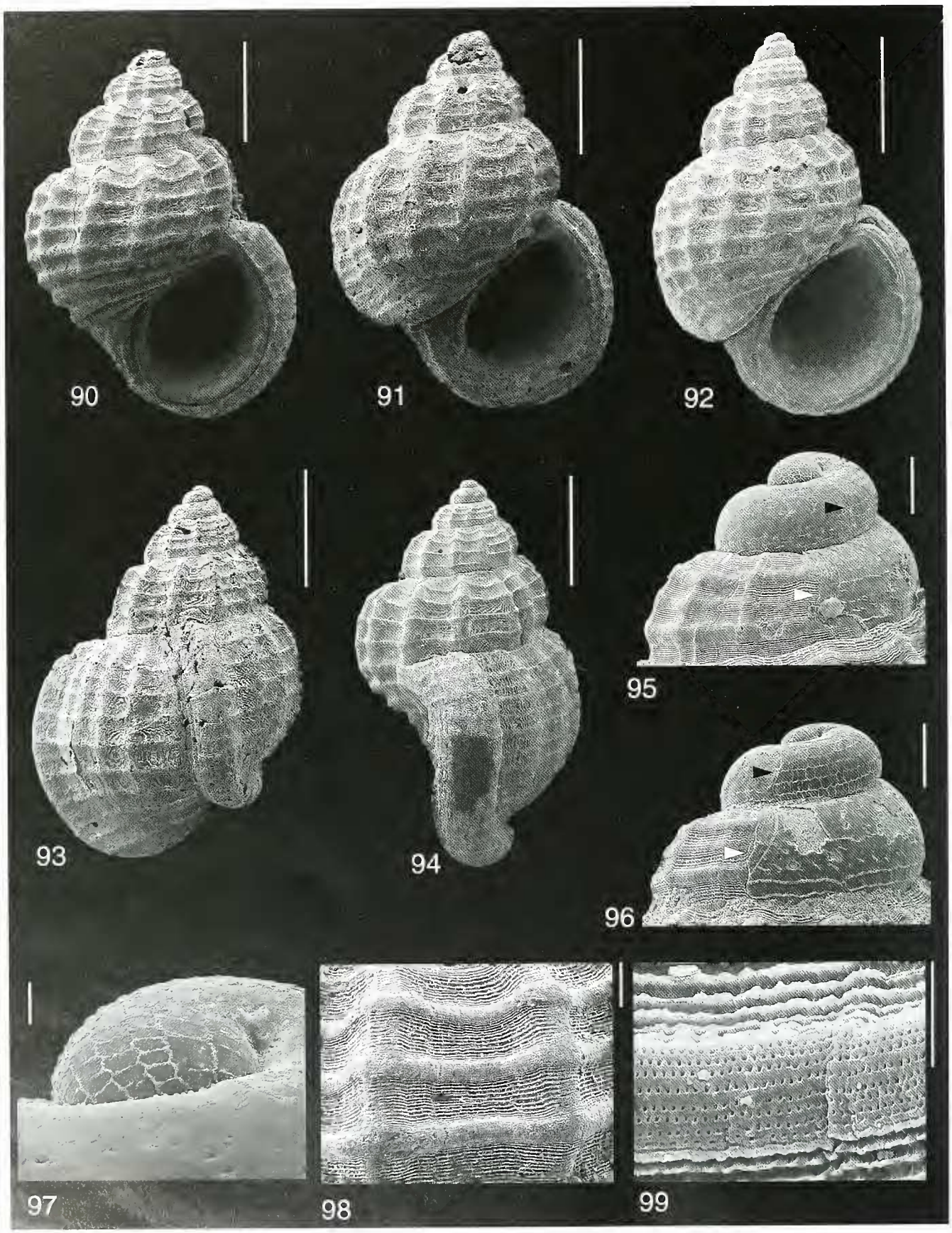
Description: Shell conical, sturdy, reaching 3.75 mm in height and 2.75 mm in width. Protoconch multispiral, conical, with 2–2.2 convex whorls and a rather immersed nucleus. Protoconch I consists of about 0.7–0.8 whorls, with a netted sculpture, consisting of 7–8 very thin spiral lirae and numerous, irregular, short and very narrow axial segments occurring in interspaces between lirae. Protoconch II is sculptured by very small, sparse granules, fused into 2–4 discontinuous ridges on central and abapical portions of latter part of last whorl. Groups of granules form very short, prosocline segments on central area, mainly close to protoconch/teleoconch transition, which is marked by a quite sinous and thin lip. Teleoconch formed by 3–3.5 convex whorls, sculptured by a primary pattern of strong, slightly sinuous and opisthocline ribs, numbering 12–14 on penultimate whorl, becoming very weak to lacking toward shell base. Ribs are covered by a secondary spiral sculpture, formed by flat narrower cords, numbering 4–5 on penultimate whorl, becoming more marked on shell base. Each cord bears a pitted microsculpture, consisting of microscopic subcircular pores forming 8–10 spiral alignments (Figures 99). Between cords, numerous, closely spaced, very fine spiral ridges appear. They are formed by rough prismatic, tooth-like elements, extending perpendicularly from shell surface. At their base, ridges have a lamella-like expansion which covers the interspaces occurring between them. Last whorl inflated, well-expanded, comprising about ¾ of total shell height, often bearing 1–2 strong varices, most frequently just before the outer lip. Aperture ovate, very rounded anteriorly, weakly angulated posteriorly, comprising about little less than ½ and ⅔ of total shell and last whorl height, respectively. Outer lip sinuous, weakly opisthocline; internally smooth, with a thin rim on its edge; externally with a very marked varicose swelling, covered by spiral sculpture, and having a narrow ridge on its base, toward aperture, so that it appears double-rimmed. Inner lip weakly curved, with a very narrow columellar thickening, forming an obsolete umbilical chink. Shell color white in Recent material.

Type Locality: Coppi (1876) cited "La Tagliata", an unknown name in toponymy (very likely referring to a recently deforested woodland) corresponding to the locality Gagliardella (Maranello, Modena, Emilia Romagna, North Italy) (S. Palazzi personal comm., 2006).

Type Material: A lot (IPUM 13721), from Coppi coll, type locality, with more than 100 possible syntypes (not seen), is housed in the MPOB, Modena.

Material Examined: Senegal: Region de Dakar, 250 m S.W. Cap Manuel, 12 shs, MNHN coll. Marche-Marchad, dét. S. Gofas [The Nautilus 113: 88–89, figs. 40, 42]; Region de Dakar, S.W. Gorée large Cap Vert, 250–150 m, 1 sh., MNHN coll. Marche-Marchad, det. S. Gofas [The Nautilus 113: 88–89, figs. 40, 42]; Region de Dakar, St. 56-1-10A Gorée 150–200 m, 1 sh., MNHN coll. Marche-Marchad, det. S. Gofas [The Nautilus 113: 88–89, figs. 40, 42]; Angola: Luanda, Ilha de Luanda, Circalittoral, 120 m, 3 shs, MNHN coll. S. Gofas, det. S. Gofas [The Nautilus 113(3): 88–89, figs. 40, 42]; Luanda, Ilha de Luanda, circalittoral, 40–60 m, 1 sh., MNHN coll. S. Gofas 1981–82, det. S. Gofas [The Nautilus 113: 88–89, figs. 40, 42]; Luanda, Au large de Mussulo (Mocôco), dredging 50–70 m, 2 shs, MNHN coll. S. Gofas 1981–1987, det. S. Gofas [The Nautilus 113: 88–89, figs. 40, 42]; Au large de Mussulo, circalittoral, 90–100 m, 2 shs, MNHN coll. S. Gofas, det. S. Gofas [The Nautilus 113: 88–89, figs. 40, 42]; Ambrizete, dredging, 80 m, 5 shs, MNHN coll. S. Gofas, det. S. Gofas [The Nautilus 113: 88–89, figs. 40, 42]; Ambrizete, (07°00′ S, 12°20′ E) sediment, 60 m, 3 shs, MNHN coll. S. Gofas, 1983, det. S. Gofas [The Nautilus 113: 88–89, figs. 40, 42]; Ambrizete, (06°57′ S, 12°23′ E), sediment, 45 m, 1 sh., MNHN coll.S. Gofas, 1983, det. S. Gofas [The Nautilus 113: 88–89, figs. 40, 42]. Italy: Piemonte, Asti, Baldichieri, "Grottino Monale", 2 shs, yellow sands, middle-upper Pliocene, coll. MF *ex* coll. PAL, F104A; Asti province, 9 shs, Pliocene, MGUP coll. Doderlein, 111A; Liguria, Savona, Rio Torsero, between Ceriale and Peagna, 5 shs, clays, lower Pliocene, coll. MF *ex* coll. PAL, F58A;

Figures 80–89. *Alvania tenera* (Philippi, 1844). **80.** Shell of a keeled and conical morph, Strait of Gibraltar, Spain, Cadiz, Tarifa, coll. PAL (2030TAR). **81–82.** Conical-ovate, not-keeled morphs, illustrating the variable sculpture, France, Provence, Marseille, Curry, coll. PAL (2037MAR). **83.** Profile view of the same shell as Figure 80. **84.** Profile view of an unkeeled morph, France, Provence, Marseille, La Baule, small beach at 25 km west from Marseille, coll. PAL (2035BAU). **85–86.** Sculpture of early teleoconch whorls (85) and detail of sculpture (86), Italy, Tuscany, Livorno, Antignano, coll. PAL (2029). **87–88.** Protoconch (87) and detail of protoconch I (88) of the same shell. **89.** Protoconch of the same shell as Figure 84, showing sculpture variation. Scale bars: 0.5 mm in Figures 80–84; 200 μm in Figure 85; 100 μm in Figures 86–87 and 89; 20 μm in Figure 88. Black and white arrows indicate the protoconch I/protoconch II and protoconch/teleoconch boundaries, respectively.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Emilia Romagna, Modena province, 35 shs, Pliocene, coll. Doderlein, 111B; Emilia Romagna, Modena province, 1 sh., Miocene, MGUP coll. Doderlein, 474; Emilia Romagna, Piacenza, Lugagnano Val d'Arda, 2 shs, "calanchi di valle" (marls), middle-upper Pliocene, coll. MF *ex* coll. PAL, F13A; Piacenza, Castell'Arquato, Monte Padova, 1 sh., blue clays, middle Pliocene, coll. MF *ex* coll. PAL, F16A; Emilia Romagna, Parma, San Nicomede, Stirone river, 50 shs and fragments, lower clays middle-upper Pliocene, coll. MF *ex* coll. PAL, F14B; Emilia Romagna, Modena, Marano on the Panaro, Panaro river, 1 sh., clays stormy layers, middle-upper Pliocene, coll. MF *ex* coll. PAL, F80A; Emilia Romagna, Modena, Maranello, Fogliano, Gagliardella (type locality), Rio Grizzaga, 60 shs, sands, middle Pliocene, coll. MF *ex* coll. PAL, F39A; Tuscany, Siena, San Donato, Ciuciano, Prison, 1 sh., clays and sands, lower Pliocene, coll. MF *ex* coll. PAL, F112A; Siena, Castiglioncello del Trinoro, Poggio Rotondo, 3 shs, marls, lower Pliocene, coll. MF *ex* coll. PAL, F54A; Lazio, Rome, Magliano Sabina, Cladocora yellow sands, 23 shs, lower Pliocene, coll. MF *ex* coll. PAL, F15A; Sicily, Palermo, Altavilla Milicia, rigth side of Milicia river, 12 shs, sands, lower-middle Pliocene, coll. MF *ex* coll. PAL, F2A; Palermo, Partitico, Trappeto, Lido Ciammarito to Nocella river mouth, 11 shs, clays, lower Pliocene, coll. MF *ex* coll. PAL, F72A.

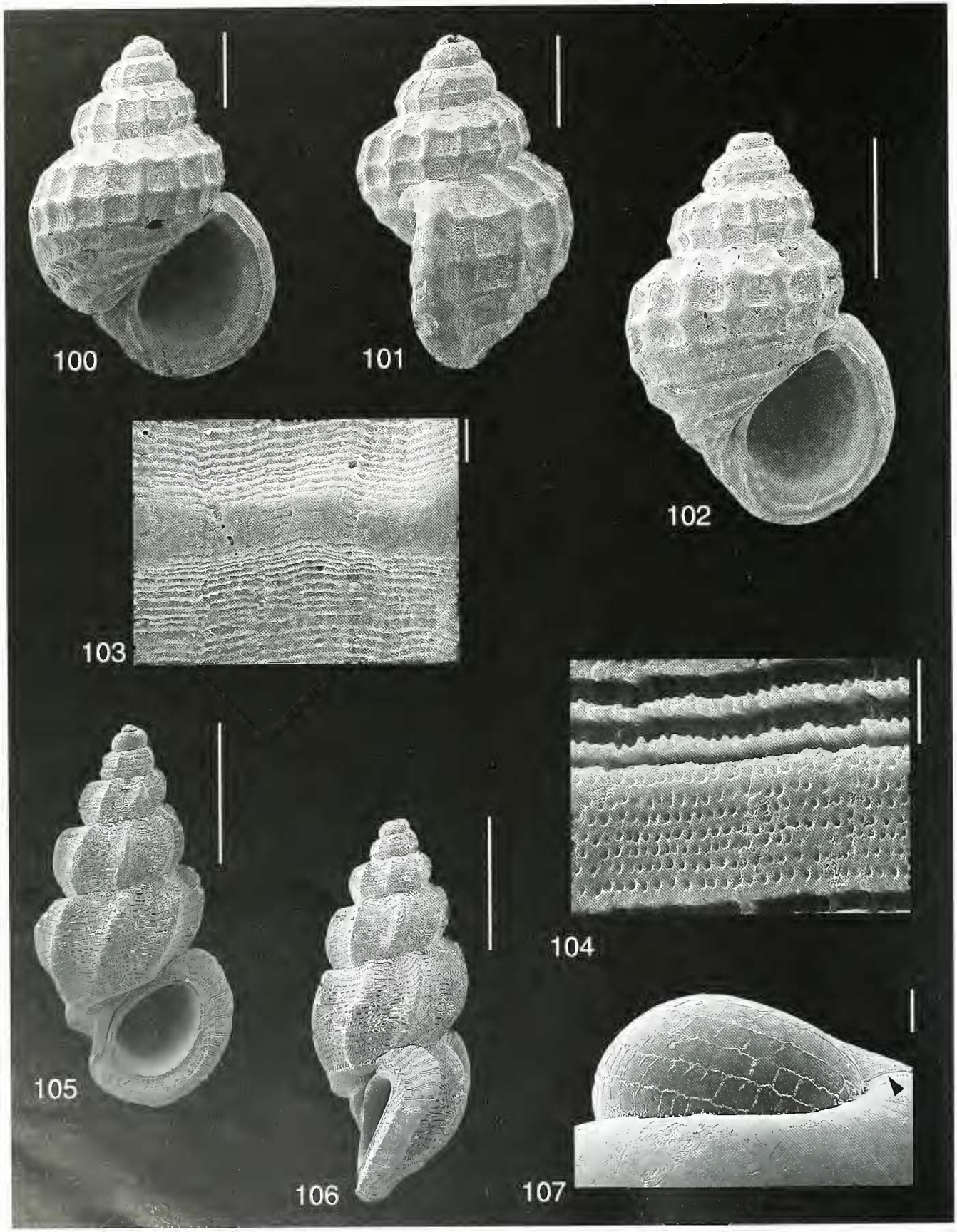
Habitat: In the Atlantic Ocean, the species has a lower shelf-upper slope distribution (see Gofas, 1999), is indicated by the fossil Mediterranean occurrences. A shallower and more restricted distribution, limited to shelf paleoenvironments, with sandy to muddy bottoms.

Distribution: The species lives in the eastern Atlantic, from Senegal to northern Angola (see also Gofas, 1999). It was also collected from the coasts of Mauritania (S. Palazzi, pers. comm., 2006). The species has a Mediterranean Miocene to Pliocene paleoditribution, being recorded from the Miocene of northern Apennines (Modena), the Pliocene of northern (Piemonte, Liguria, Toscana, Emilia Romagna), central (Lazio) and insular (northwestern Sicily) Italy, south Spain (Estepona) Landau et al. (2004, as *Alvania fariae*), and Algeria (Cossmann, 1921). In Atlantic, it is recorded from the Portuguese middle Pliocene of Mondego Basin (Landau et al., 2004). The citation of Wenz (1938: 616), according to which the species lived in the Oligocene (up to Pliocene of Europe, North Africa and North America), should be verified. The species was not found in the very rich mollusc assemblages from the Oligo-Miocene of southwestern France (Lozouet, 1998; 1999).

Remarks: Gofas (1999) and Landau et al. (2004), discussing and re-describing this species, originally described as *Manzonia fariai* by Rolán and Fernandes (1990) from West Africa, did not recognize its identity as *Rissoa tiberiana* Coppi, 1876, the latter being a common species from the Mediterranean Neogene, particularly from the Pliocene. This species, originally not illustrated by Coppi (1876), was figured by Sacco (1895: figs. 67, a-bis and 68, a–b), who designated it as the type species of the subgenus *Galeodinopsis* Sacco, 1895. More recently, this species was illustrated by Cossmann (1921: pl. 1, figs. 55–56) and Wenz (1938: fig. 1715). Comparison between fossil material of *R. tiberiana* (Figures 90–94, also from topotype material; see also Landau et al., (2004: pl. 7, figs. 3–4), to that of Rolán and Fernandes (1990: pl. 1, figs. 4–6), and of Gofas (1999: figs. 39–42) strongly confirms the above mentioned synonymy. The rather conical, ribbed shell with an inflated last whorl, the frequent presence of varices on the last whorl, and the double-rimmed outer lip are the most characteristic features of this species, which shows a modest variability in the number and strength of ribs and in the spire elevation (see Figures 90–92).

Gofas (1999) moved this species from *Manzonia* Brusina, 1870 [type species *Manzonia crassa* (Kanmacher, 1798), see Figures 104–107] to *Alvania* based on the lack of the characteristic punctate spiral sculpture of the former taxon. This does not appear appropriate. In fact, in reasonably well-preserved shells, the primary spiral cords clearly bears a microsculpture consisting of regular, spirally arranged pits, quite like *M. crassa* (compare Figure 99 with Figure 106). This spiral pitted microsculpture, considered a typical *Manzonia* character by Moolenbeek and Faber (1987), was indicated by Bouchet and Warén (1993) as not restricted to this genus (occurring in *Alvania*, *Gofasia* Bouchet and Warén, 1993, and with a rough similarity, in Rissoininae species, see Gofas, 1999, figs. 79–80, 85, and 89]). The same authors interpreted it as a symplesiomorphy retained in *Manzonia* and in other rissoid genera. However, the particular structure of the secondary, very fine spiral threads, formed by roughly prismatic elements growing perpendicularly to the shell surface, is a character shared by the *Manzonia* species, never observed in *Alvania*, and retained only in the recently described genus *Gofasia* (see Bouchet and Warén, 1993, fig. 1557). The combi-

Figures 90–99. *Galeodinopsis tiberiana* (Coppi, 1876). **90–93.** Shells from the type locality, showing variability and varices, middle Pliocene of Italy, Emilia Romagna, Modena, Maranello, Fogliano, Gagliardella, Rio Grizzaga sands, coll. MF *ex* coll. PAL (F39A). **94.** Profile view of a shell from the middle-upper Pliocene of Italy, Emilia Romagna, Parma, San Nicomede, Stirone River, coll. MF *ex* coll. PAL (F14B). **95–96.** Protoconchs from the same locality, note variation of the abapical sculpture just behind the transiction to teleoconch. **97.** Detail of protoconch I, showing the netted microsculpture and the partially immersed nucleus, same shell as Figure 95. **98.** Detail of teleoconch sculpture from the shell as Figure 90. **99.** Detail of teleoconch microsculpture from the shell as Figures 95–96; note the pitted pattern on the spiral cord and the structure of the fine spiral ridges. Scale bars: 1 mm in Figures 90–94; 100 μm in Figures 95–96; 50 μm in Figure 98; 20 μm in Figures 97, 99. Black and white arrows indicate the protoconch I/protoconch II and protoconch/teleoconch boundaries, respectively.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nation of these characters (pitted sculpture and structure of fine spiral threads) represents a quite singular and original feature, which should be regarded as limited to *Manzonia*-related species.: e.g. *M. darwini* Moolenbeek and Faber, 1987 (pl. 1, fig. 18), *M. crispa* (Watson,1873) (see Moolenbeek and Faber, 1987, pl. 3, fig. 54), *M. boogi lanzarottii* Moolenbeek and Faber, 1987 (pl. 2, fig. 39), *M. spreta* (Watson, 1873) (see Moolenbeek and Faber, 1987, pl. 3, fig. 57), *M. vigoensis* (Rolán, 1983) (see Bouchet and Warén, 1993, p. 656, fig. 1499) and several others. The double rimmed outer lip and the netted sculpture of protoconch 1 are also characters shared by *Manzonia* species. However, it must be considered that these two features, considered by Ponder (1985: 46) as typical of *Manzonia* sensu stricto, should be regarded with suspicion, being as they are shared by well-recognized *Alvania* species. In regard to the protoconch, species such as *A. testae* (Aradas and Maggiore, 1844), *A. zetlandica* (Montagu, 1815) (see Bouchet and Warén, 1993, figs. 1386–1387 and 1502; Landau *et al.*, 2004, pl. 9, figs. 1b–1d), the Pliocene *Alvania magistra* Chirli, 2006 (pl. 11, fig. 16 and pl. 12, figs. 1–3), have the same sculptural pattern on protoconch I. *A. tomentosa* (Pallary, 1920), which has a paucispiral protoconch, also exhibits this sculpture (see Bouchet and Warén, 1993, fig. 1388).

Rissoa tiberiana could be regarded as one (probably the sole) of the few survivors of a group of species close to *Manzonia* sensu lato, which very likely originated in the upper Paleogene. The European Oligocene *Rissoa duboisi* Nyst, 1843 (Figures 100–103) certainly belongs to this group. Both these species share several intersting characters: a quite conical *Alvania*-like shell shape, often provided with varices on the last whorl, the arrangement of the basal cords (not so strong as in *Manzonia* sensu stricto, where keels occur on the shell base), the above mentioned combination of the microsculptural pattern, and the kind of axial sculpture (with slightly sinuous, less pronounced ribs than those shown by *Manzonia*), and a double, weakly opisthocline outer lip. All this leads me to revalue *Galeodinopsis* as the useful generic placement for such *Manzonia*-related species.

In overall appearance, *G. duboisi* (Nyst, 1843) strongly resambles *G. tiberiana*, from which it differs principally in having less numerous cords and ribs and less convex whorls (see also Ponder, 1985, fig. 100c). Another comparable species is the Recent Macaronesian *M. spreta* (Watson, 1873), which has a similar shell shape but differs from *G. tiberiana* in having a more delicate axial sculpture (the spiral cords being large and almost flat) a more rounded and smaller aperture, and a paucispiral protoconch (see Moolenbeek and Faber, 1987, figs. 47a–b and 55–57). With some significant reservations, it could be regarded as belonging to *Galeodinopsis*. The species *M. foraminata* (Lozouet, 1998), originally described as *Alvania* (from the upper Oligocene of southwestern France, see Lozouet, 1998, fig. 9f–h), *M. moulinsi* (d'Orbigny, 1852) (see Lozouet, 1998, fig. 9i–j, from the French upper Oligocene), *M. scalaris* (Dubois, 1831) (Kowalke and Harzhauser, 2004, fig. 8d, from the middle Miocene, Badenian, of Austria, Hungary, Poland and Romania and the Miocene of Russia) and the Recent *Manzonia crispa* (Watson, 1875) (of which I studied 3 shells from Madeira, ZMA Moll. 101.0, *ex* coll. R.G. Moolenbeek; see also Ponder, 1985, fig. 100A and Moolenbeek and Faber, 1987, text-fig. 46, and pl. 3, fig. 52–54) show less affinities, having a more slender shell with more curved ribs (protruding over the suture in *M. scalaris*), which become stronger on the base of the shell. All these four species appear more related to *Manzonia* than to *Galeodinopsis*.

Sacco (1895) and Cossmann (1921) indicated *Rissoa multicostata* Speyer 1864 (pl. 41, figs. 3–5, from the Oligocene of Germany) as a possible *Galeodinopsis* species. I did not see any shells of this *Alvinia* sensu lato-like species, which more closely resembles the group of *Alvania zetlandica* (Montagu, 1815) and *A. weinkauffi* (Weinkauff, 1868 *ex* Schwartz ms.). The original illustrations show a turreted shell with a more finely cancellate (not-ribbed) sculpture, bearing almost orthocline axial ribs, characters which militate against placement in *Galeodinopsis*.

The material of *Rissoa tuba* Doderlein, 1862, housed in the MGUP Doderlein's collection (from the Miocene and Pliocene of North Italy), belongs to this species. Anyway, Doderlein (1862: 17) just listed this taxon without providing a description or a valid reference, so that *R. tuba* must be considered a *nomen nudum*.

CONCLUDING REMARKS

As indicated by Ponder (1985), the systematic grouping of *Alvania* species at the subgeneric level is quite difficult and putative groups usually fold into synonymy with *Alvania* sensu stricto. This viewpoint appears be applicable to the species studied in this report (except for *Rissoa tiberiana* Coppi, 1876). The subgeneric division into *Galeodina* and *Massotia* lacks any valid and convincing basis in shell features (especially on consideration of

Figures 100–107. *Galeodinopsis duboisi* (Nyst, 1843) (100–103), from the upper Oligocene of Hessen (Germany, SE of Kassel, Hessisch-Lichten, Glimmerode, coll. MF *ex* coll. Pal. FE15A) and *Manzonia crassa* (Kanmacher, 1798) (104–107), type species of *Manzonia* Brusina, 1870, from the middle-upper Pleistocene of Kyllini (NW Peloponnesus, Greece, N2 bed of Garilli et al., 2005a). **100–102.** Apertural (100 and 102) and profile (101) views. **103–104.** Microsculptures, showing the typical pitted surface on the flat cords and the microstructure of the narrow spiral threads in *G. duboisi* (103, same shell as Figure 101) and *M. crassa* (104, same shell as Figure 105). **105–106.** Apertural (105) and profile (106) view of shell. **107.** Detail of protoconch I, showing the netted sculpture. Scale bars: 1 mm in Figures 97–98; 20 μm in Figure 100; 10 μm in Figure 99. The black arrow indicates the protoconch I/protoconch II boundary.

the often extensive intraspecific variation). In effect, a link between the markedly keeled and inflated shells (e.g. *A. carinata*), and the more typical *Alvania*-shape taxa could be hypothesized. It could be articulated and summarized in the transition *A. carinata*-*A. lactea* (via *A. francescoi* new species-*A. rosariae* new species) to more typical *Alvania* secies. A parallel trend could be constructed: *A. tenera* and *A. cingulata*, showing a progressive weakening of the spiral sculpture, the proportional reduction in the expansion of the body whorl and the formation of the outer lip thickening. Furthermore, other interspecific trends, involving various nominal groups of *Alvania*, could be constructed when considering the widely variable shells of most of the species discussed here. Nowstanding this, I cannot deny that all these hypothetical links appears tenuous and that these taxa, sharing a quite inflated and well-expanded body whorls, a wide, internally smooth aperture, seem somewhat distant from *Alvania* sensu stricto This point of view could lead to regard them as belonging to an inclusive taxonomic group (preferably at subgeneric level). *Galeodina* could serve as the appropriate taxonomic unit. Nevertheless, since I believe that appropriate anatomical studies (of which there is no exhaustive data-set) should be used to solve this question, I have preferred a more open-ended option, placing the discussed species here, from *carinata* to *tenera*, in *Alvania* sensu lato

The re-analysis of the Neogene-Recent *R. tiberiana*, type species of *Galeodinopsis*, has lead me to reevaluate the latter taxon as the appropriate genus for grouping species characterized by a particular teleoconch microsculpture (consisting of very fine spiral threads, formed by roughly prismatic elements, extending perpendicularly respect from the shell surface, plus the pitted surface on the primary spiral cords, as seen in *Manzonia*) and by having a conical *Alvania*-like shell shape. The oldest representative of this genus is the European upper Oligocene *R. duboisi*. The upper Oligocene *M. foraminata* and *M. moulinsi* are probably more linked to *Manzonia* sensu lato than to *Galeodinopsis* while the Recent Macaronesian *M. spreta* could be doubtfully regarded as belonging to *Galeodinopsis*.

Because of its affinity with *Alvania*, *Galeodinopsis* probably derived from some Oligocene group of that taxon and could be regarded as a transitional link to *Manzonia*. It is interesting that, as indicated by Lozouet (1998), the genus *Alvania* had a surprising radiation in the upper Oligocene, creating a strong diversification. Furthermore, the *Manzonia* sensu stricto species, characterized by the quite slender shell with strongly opisthocline ribs and very marked spiral cords on the shell base, seem to be well-established from the European Neogene, where they are represented by the following species: *M. crassa*, *M. falunica*, *M. pontileviensis*, and *M. scalaris*.

All the discussed species have a multispiral protoconch, indicating a planktotrophic larval development, with the exception of *A. cingulata*, which is the most geographically restricted species, limited to Sicilian waters. The reason for its very limited geographical distribution is not certainly solely attributable to its non-planktotrophic larval development. Our knowledge about this species is not encouraging: I just know that:

- There is no known fossil record . . . is it a very recent Mediterranean acquisition?
- From a large amount of bulk samples (about 50 liters from Magnisi and 20 liters from Mondello), I picked only a single eroded shell! . . . Is it still a living species?

Among species with planktotrophic development discussed in this report, three show an eastern Atlantic-Mediterranean distribution: *A. carinata*, *A. lactea*, and *A. tenera*. Among these, the first two species have a Neogene to Recent distribution, being known from the Pliocene and the Miocene of Mediterranean basin, respectively, and show a quite extensive east Atlantic distribution, being commonly recorded from the English Channel to Morocco. Regarding the third species, living in Mediterranean and along the Atlantic Morocco and the Canary Islands coasts, I did not find any Mediterranean or Atlantic fossil records. The extinct species *A. francescoi*, *A. prusi*, and *A. rosariae* are limited to the Mediterranean Pleistocene, while *Galeodinopsis tiberiana* has a Miocene-Pliocene Mediterranean distribution and lives along the W African coasts from Mauritania to northern Angola.

In general, the protoconchs of the species reported here do not indicate any distinguishing taxonomical characters at the supraspecific, and, in most cases, at the species level, being characterized by sculptural patterns shown by several rissoid species. Among the planktotrophic species, the commonest sculptural pattern on protoconch I (observed in *A. carinata*, *A. francescoi*, *A. lactea*, *A. rosariae*, and *A. tenera*), consisting of fine spiral lirae and scarce to abundant pimples between them, is shown by *A. cancellata* (Da Costa, 1778) (see Giannuzzi-Savelli et al., 1996, fig. 408b), *A. beani* (Hanley in Thorpe, 1844) (see Giannuzzi-Savelli et al., 1996, fig. 412), *A. cimex* (Linnæus, 1758) (see Ponder, 1985, figs.86C–B), *A. cimicoides* (Forbes, 1844) (see Bouchet and Warén, 1993, fig. 1385 and Giannuzzi-Savelli et al., 1996, fig. 408d), *A. dingdensis* (Janssen, 1967) (see Ponder, 1985, figs. 88F–G), *A. geryonia* (Nardo, 1847) (see Giannuzzi-Savelli et al., 1996, fig. 395c), *A. hispidula*, Monterosato, 1884 (see Gofas, 1999, fig. 26), *A. punctura* (Montagu, 1803) (see Giannuzzi-Savelli et al., 1996, fig. 436), *A. stephanensis* Lozouet, 1998 (fig. 9D), *Crisilla semistriata* (Bouchet and Warén, 1993, fig. 1535), *Rissoa parva* (Da Costa, 1778) (see Ponder, 1985, figs. 79B), and several other species. The sculptural pattern on protoconch II (also observed in *G. tiberiana*), consisting of 1–3 more or less discontinuous, abapical to central, spiral threads (also formed by short, fused, prosocline segments close to the beginning of the teleoconch) and tubercles on the remaining surface, is also shown by most of the above mentioned species and several others. *Al-*

vania lactea could represent a slight exception, having a quite characteristic, easily distinguishable protoconch I with a coarser sculpture than that shown by the other studied species. *A. tenera* shows a similar protoconch II sculptural pattern, with few to abundant very small granules spirally arranged, which may form very discontinuous and irregular ridges. Likewise this kind of sculpture is shared by other rissoids (e.g. *A. tarsodes* (Watson, 1886) (see Bouchet and Warén, 1993, fig. 1450) and *Crisilla semistriata*). The sculpture of the paucispiral protoconch of *A. cingulata*, which is almost a replica of protoconch I of the first group discussed above, represents a quite common pattern shown by several non-planktotrophic rissoids: e.g. *A. argillensis* Lozouet, 1998, *A. macandrewi* (Manzoni, 1868), *Lironoba multilirata* (T. Woods, 1878), *Onoba gianninii* (Nordsieck, 1974) and, with a moderate similarity, by *A. subsoluta* (Aradas, 1847), *Onoba semicostata* (Montagu, 1803), and *A. virodunensis* Lozouet, 1998 (see Ponder, 1985, fis 89A, 109E and 126C; Bouchet and Warén, 1993, figs. 1458, 1525; Lozouet, 1998, figs. 10F and 10K).

There is similarity between the West African rissoid assemblages, including the Macaronesian province, and the European ones, with particular regard to those from the Mediterranean Neogene. This similarity is perhaps more marked than it has been indicated by Gofas (1999). The case of *G. tiberiana* is a further (see Monegatti and Raffi, 2001, and Garilli and Galletti, 2007) interesting case of a molluscan species that lived in the Mediterranean Neogene and today occurrs along the West African coasts. In this view, it is noteworthy to remark that, as a whole, most of the species here included in *Galcodinopsis* lived in the European Oligo-Pliocene while its living representings occurs along the West Africa and Macaronesian Provinces. In addition, *A. tenera*, living in the Mediterranean, Atlantic Morocco, and in the Canary Islands (Tenerife), should be regarded as a new record, further supporting the discussed similarity. The rissoid *Rissoina* d'Orbigny, 1840, species from the Mediterranean Plio-Pleistocene (see the good illustrations of Greco, 1974, figs. 11, 13, 15, 17 and Chirli, 2006, pl. 23, figs. 7–12), usually cited as *R. decussata* (Montagu, 1803), is very likely the same taxon as living along the W African coasts, São Tomé and Cape Verde Islands [see Gofas, 1999: 97, figs. 69–73, and treated as *R. punctostriata* (Talavera, 1975)].

The rather common presence of varices on the last whorl (a rare character in rissoids) of *A. carinata*, *A. francescoi* new species, *A. lactea*, *A. rosariae* new species, and *G. tiberiana* should not be regarded as a salient taxonomic character at the supraspecific level, being present in quite unrelated species (e.g. *A. carinata* and *G. tiberiana*).

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